APPENDIX B

ANALYTICAL LABORATORY DATA
(INLCUDED ON CD ONLY)

APPENDIX C

DATA VALIDATION NARRATIVES (INCLUDED ON CD ONLY)

Data Evaluation Narrative
AMEC Project: Former Williams AFB
AMEC Project Number: 9101110001.5300.5301
Site: ST012 – Enhanced Bioremediation Field Test
Sampling Event: July 2014
Matrix: Groundwater

SDG: 280-57958-1

1.0 INTRODUCTION

A data quality evaluation (DQE) was performed on the data reported for the Enhanced Bioremediation Field Test conducted at Site ST012 in July 2014, at the former Williams Air Force Base (AFB), Mesa, Arizona. The following sections provide summary discussions of the required data qualifications for each site and analytical methods for samples collected at the former WAFB. Data validation was conducted on 100% of the primary samples and field quality control samples (trip blanks, rinsate blanks, sample duplicates, and matrix spike/matrix spike duplicate [MS/MSD] samples). A Level III (Step IIB) data validation was performed using supplemental checklists to review the following quality control elements: laboratory case narrative, sample documentation, chain-of-custody, holding time protocols, method-specific calibration information, mass tunes, method blank results, laboratory control sample (LCS) results, surrogate recoveries (where applicable), MS/MSD recoveries and relative percent differences (RPDs), field duplicate RPDs, trip and equipment/rinsate blanks, method-specific QC elements (such as interelement check standards (ICS), serial dilutions, post digestion spikes (PDS), column breakdown, etc.), method sensitivity, and completeness.

Data were reviewed using precision and accuracy control limits presented in The Department of Defense (DoD) Quality Systems Manual (QSM) Version 4.2 (DoD, 2010). DQE data qualifications were applied if necessary in accordance with procedures in Air Force Center for Environmental Excellence (AFCEE) Quality Assurance Project Plan (QAPP), Version 4.0.01 (AFCEE, 2005), the method, and professional judgment using the following qualifiers:

J = The reported concentration is considered an estimated value due to discrepancies in meeting certain analyte-specific quality control criteria.
F = The reported concentration is between the limit of quantitation/reporting limit (LOQ/RL) and method detection limit (MDL) and is considered an estimated value
UJ = The target compound was not detected and the reporting limit is considered imprecise due to discrepancies in meeting certain analyte-specific quality control criteria.
B = The result may be biased high or a false positive based on blank data.
M = The reported concentration is estimated due to matrix effects.
R = The data are considered unusable due to discrepancies in meeting certain quality control criteria and may not be used in decision making.

2.0 DELIVERABLES

The data packages as submitted to AMEC Environment and Infrastructure, Inc. (AMEC) are complete as stipulated in the Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) for Site ST012 Enhanced Bioremediation Field Test Plan (AMEC, 2014), and the applicable guidelines described in the former Williams AFB Performance Based Remediation Program QAPP and standard operating procedures (SOPs) (collectively referred to as the QAPP/SOP [AMEC, 2012]) for U.S. States Environmental Protection Agency (EPA) Methods SW9056A, and SW6010C.

3.0 SAMPLE INTEGRITY

Samples within this sample delivery group (SDG) collected from ST012 were submitted to TestAmerica Laboratories (TAL) in Denver, Colorado for anions by Method SW9056A and select metals by Method SW6010C.

Based on the information provided on the cooler receipt forms, samples arrived at the laboratory within the recommended temperature and preservation requirements.

Completed Chain-of-Custody (COC) documents are included in the data package.

4.0 SAMPLE IDENTIFICATION

This SDG contains the following water and quality control (QC) samples:

Site: ST012	QC Samples
ST012-W30-NABRSOL	

These samples were collected on 17July 2014. The laboratory performed matrix spike/matrix spike duplicate analysis on sample ST-W30-NABRSOL.

5.0 SAMPLE QUALIFICATION

Only those components that required qualification of the data are presented in this narrative. All Level III components were within the DoD QSM QC limits, with the following exceptions:

- Constituents were present in the associated blanks (no qualification required).
- Metals were detected in the Interference Check Solution A (ICSA) (no qualification required).
- MS/MSD recoveries were outside QC limits (no flags applied).
- PDS recoveries were outside QC limits for metals (no flags applied).

6.0 ANIONS (SW9056A)

Samples collected from site ST012 were submitted for Anions by Method SW9056A. A Level III validation was performed on this method and only those components that exceeded the QAPP/SOP criteria are presented below. Each of the Level III components was within the QAPP/SOP QC criteria.

6.1 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of Anions by USEPA Method SW 9056A with the exception of analytes that required dilution. The sample in this SDG required dilution for chloride, bromide and sulfate resulting in elevated LOQs. The laboratory indicated a dilution with a "D" qualifier which was subsequently removed during the validation process.

7.0 METALS (SW6010C)

Samples collected from Site ST012 were submitted for the major metal cations by EPA Method SW6010C. Samples were analyzed for calcium, iron, magnesium, manganese, potassium, and sodium. A Level III validation was performed on this method and only those components that required qualification of the data are presented in this narrative. All Level III validation was performed on this method and only those components that exceeded the SAP/TAL SOP criteria are presented below. The following components exceeded the QC criteria or were noted:

- Constituents were present in the associated blanks and flagged "B" (no flags applied).
- Metals were detected in the Interference Check Solution A (ICSA) (no qualification required).
- PDS recoveries were outside QC limits for two metals (no flags applied).

7.1 Method Blanks

One method blank showed the presence of calcium (106 J µg/L). Associated sample results less than 5x the blank value were qualified as estimated and flagged "B".

Action: No qualification was required because the associated calcium results in the sample were greater than 5 x the blank value.

7.2 Interference Check Solution A (ICSA)

Manganese was detected in the ICSA solution associated with prep batch 280-236485. The vendor verified that the ICSA contained these trace impurities.

Action: No qualification is required for impurities verified by the vendor.

7.3 Matrix Spike/Matrix Spike Duplicate

The laboratory performed MS/MSD on the sample ST012-W30-NABRSOL for metals. The MS recovery for calcium, iron, and manganese recovered below the QC limit and potassium

recovered above the QC limits. No qualification is required if the recoveries were high and the samples were non-detect or the analyte was present in the sample at concentrations greater than 4x the spike amount.

Action: No qualification was required for any of the metals in sample ST012-W30-NABRSOL because they were present in the sample at greater than 4x the spike amount.

7.4 Post Digestion Spike

The laboratory performed a PDS on sample ST012-W30-NABRSOL and the recovery for calcium, magnesium, manganese, and potassium in sample recovered below the QC limit. No qualification is required if the recoveries were high and the samples were non-detect or the analyte was present in the sample at concentrations greater than 4x the spike amount.

Action: No qualification was required for calcium and manganese results in sample ST012-W30-NABRSOL because the metals were present in the sample at greater than 4x the spike amount or the MS/MSD recovery was within control.

7.5 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of metals by USEPA Method SW6010C except where dilutions were required to place the constituent concentration within the calibration range. Dilutions were required for the sample in this SDG resulting in elevated LOQs. The laboratory indicated a dilution with a "D" qualifier which was subsequently removed during the validation process.

8.0 OVERALL SITE EVALUATION AND PROFESSIONAL JUDGMENT

Edits to the DQE qualifiers by professional judgment were not required.

9.0 SUMMARY OF DATA QUALITY INDICATORS

This section provides an assessment of the data based on project data quality indicators (DQIs) described on QAPP Worksheet #37 of the Program Document QAPP/SOP (AMEC, 2012). The DQIs consist of precision, accuracy, representativeness, comparability, completeness, and sensitivity.

9.1 Precision

An assessment of precision of analytical data is accomplished via review of field duplicate and MS/MSD analyses. Field duplicate and MS/MSD analyses are used to assess field variability, which includes sample collection/handling as well as matrix homogeneity. Precision is expressed as the relative percent difference (RPD) between results for duplicate pairs.

Field duplicate samples were not submitted with this SDG. A MS/MSD was performed on the project sample for metals and the RPDs were within QC limits. Precision for metals and anions was additionally evaluated through the analysis of the LCS/LCSD and the RPDs were compliant

with the QAPP/SOP. Therefore, the overall method and sample matrix precision are acceptable and achieve project objectives.

9.2 Accuracy (Bias)

An assessment of accuracy of analytical data is accomplished via evaluation of the spike recoveries in the MS/MSD, LCS, post digestion spike samples, and surrogate spike compounds, in addition to calibration criteria. Accuracy is expressed as percent recovery. Accuracy data were compliant with the QAPP/SOP with the exception of MS/MSD and/or PDS recoveries for the metals; however, no qualification was applied because the metals were present in concentrations greater than 4x the spike amount. Therefore, the data results indicate method and matrix accuracy is acceptable to achieve project objectives.

9.3 Representativeness

Representativeness for the analytical data is determined through evaluation of the associated blank data and evaluation of appropriate sample handling procedures. All samples were properly stored and preserved in the field and at TestAmerica. Method blanks contained low-levels of calcium which did not result in qualification; therefore, the data is representative of the Site conditions.

9.4 Comparability

Comparability addresses the confidence with which one data set can be compared to another. Use of appropriate sampling methods, COC procedures, and EPA-approved analytical methods, as well as adherence to strict QA/QC procedures, provide the basis for uniformity in sample collection and analysis. Analytical data were generated by TestAmerica using standard reporting units of micrograms per liter for metals and milligrams per liter for anions. In addition, sample collection and analytical method protocols were implemented in accordance with approved, documented procedures. Analytical data are determined to be comparable to previous Site results; however, due to shipping delays may be biased low.

9.5 Completeness

Completeness of the field sampling activities were assessed in terms of the actual number and type of sample results received from the field and laboratory, as compared with the planned number and type of sample results. All samples planned were collected which meets a field completeness of 100%.

Analytical completeness of data is a measure of the number of valid project-specific data results obtained in comparison to the total number of data results projected to achieve project DQOs. Valid data are defined as data that meet the project-specific DQOs. No data were rejected as a result of the data validation. The completeness goals met the 90 percent goal for field and laboratory data expected for this project.

9.6 Sensitivity

Analytical methods and RLs were implemented in accordance with the QAPP/SOP and EPA promulgated methodologies. Method RLs were achieved for the event except when sample

dilutions were required to bring target compounds within the linear range of the instrument calibration. As previously mentioned, the sample within this SDG required dilutions formetals and anions to place the results within the calibration range. These include modified RLs for selected detections; therefore, sensitivity requirements were met for non-diluted constituents.

9.7 Usability Summary

The data generated during the July 2014 sampling event meet the project DQOs. The DQOs for the Enhanced Bioremediation Field Test is to produce data to support design of anaerobic methods for the ST012 remedy if selected.

10.0 REFERENCES

AFCEE, 2005. Quality Assurance Project Plan, Version 4.0.01, May, 2005.

AMEC, August 11, 2014. *Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) (Enhanced Bioremediation Field Test Plan) Operable Unit 2 Site ST012 - Liquid Fuels Storage Area, Former Williams Air Force Base, Mesa, Arizona*.

AMEC, February 23, 2012. *Performance Based Remediation Program Quality Assurance Project Plan (QAPP) and Standard Operating Procedures (SOPs) (QAP/SOP), Former Williams Air Force Base, Mesa, Arizona*.

DoD, 2010. Department of Defense Quality System Manual, Version 4.2 Final, October 2010.

Prepared/Date: JAH 9/22/2014
Checked/Date: DWK 9/22/2014

Flagged Data Reports

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-57958-1

9-22-14

Client Sample ID: ST012-W30-NABRSOL

Lab Sample ID: 280-57958-1 Date Sampled: 07/18/2014 0947
Client Matrix: Water Date Received: 07/19/2014 0850

6010C Metals (ICP)

Analysis Method:	6010C	Analysis Batch:	280-238102	Instrument ID:	MT_026
Prep Method:	3010A	Prep Batch:	280-236485	Lab File ID:	26A080714B.asc
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	08/07/2014 2006			Final Weight/Volume:	50 mL
Prep Date:	07/30/2014 1230				

Analyte	Result (ug/L)	Qualifier	DL	LOQ
Calcium	220000	J	35	1000
Iron	7300	J	22	100
Magnesium	46000		11	500
Manganese	3600	Q J	0.25	10
Sodium	120000		92	5000

Analysis Method:	6010C	Analysis Batch:	280-238726	Instrument ID:	MT_026
Prep Method:	3010A	Prep Batch:	280-236485	Lab File ID:	26A081214A.asc
Dilution:	50			Initial Weight/Volume:	50 mL
Analysis Date:	08/12/2014 1855			Final Weight/Volume:	50 mL
Prep Date:	07/30/2014 1230				

Analyte	Result (ug/L)	Qualifier	DL	LOQ
Potassium	4300000	J D	12000	150000

General Chemistry

Client Sample ID: **ST012-W30-NABRSOL**

Lab Sample ID: 280-57958-1
Client Matrix: Water

QH 9-22-14

Date Sampled: 07/18/2014 0947
Date Received: 07/19/2014 0850

Analyte	Result	Qual	Units	DL	LOQ	Dil	Method
Bromide	220	D	mg/L	5.7	25	50	9056A
Analysis Batch: 280-237574	Analysis Date: 08/05/2014 2359						
Orthophosphate as P	1.0	U	mg/L	0.94	2.5	5.0	9056A
Analysis Batch: 280-235057	Analysis Date: 07/19/2014 1513						
Chloride	510	D	mg/L	1.3	15	5.0	9056A
Analysis Batch: 280-235056	Analysis Date: 07/19/2014 1750						
Sulfate	3800	D	mg/L	4.6	100	20	9056A
Analysis Batch: 280-235058	Analysis Date: 07/19/2014 2349						

Data Quality Evaluation Checklists

Method Validated: 9056A | Initial Review by: J. Hartness | Date: 9/22/14 | SDG#: 280-57958-1
Senior Review by: D. Knaub | Date: 9/22/14 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	ok
Limit of Detection Determination and Verification (LOD) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOD verification checks shall be performed (see box D-13)	See 40 CFR 1368. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL / LOD verification check at higher level and set MDL higher or reconduct MDL study (see box D-13).	NA	Samples cannot be analyzed without a valid MDL.	Pg. 93-98 6/16/2013
Limit of Quantitation Establishment and Verification (LOQ) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOQ verification checks shall be performed (see box D-14)	Within calibration range including low standard; within method precision and accuracy.	Re-run LOQ	NA	Samples cannot be analyzed without a valid LOQ	MRL check: Level 3 Package Pg. 92 (7/19/14) = OK

Method Validated: 9056A

Initial Review by: J. Hartness Date: 9/22/14

Senior Review by: D. Knaub Date: 9/22/14

SDG#: 280-57958-1

Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time (RT) Window Width Calculated for Each Analyte and Surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 24-hour study.	NA	NA		OK
Container, Preservation, and Holding Time	All field samples	500 ml poly, Cool to 4°C Nitrate – 48 hours Nitrite, sulfate, chloride – 28 days	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collected: 7/18/14 Temp: Analyzed: 7/19/14
ICAL for All Analytes (Minimum Three Standards and One Calibration Blank)	Initial calibration prior to sample analysis	R ≥ 0.995	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.	Level 4 Package Pg. 873 Inst IC_6 8/01/14(Br) OK Pg 878 Inst: WC_IonChrom10 - 7/15/14 (o-PO4, SO4) OK Pg -875 Inst: WC_IonChrom8 – 7/15/14(Cl) OK
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 10% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	Pg. 85-87 Level 3 Package OK

Method Validated: 9056A

Initial Review by: J. Hartness Date: 9/22/14

Senior Review by: D. Knaub Date: 9/22/14

SDG#: 280-57958-1

Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL and at the beginning of the analytical shift	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift.	NA	NA		Ok
Midrange Continuing Calibration Verification (CCV)	After every 10 field samples and at end of the analysis sequence.	All analytes within established retention time windows and within ± 10% of true value	Correct problem then repeat CCV. If that fails, then repeat ICAL. Reanalyze all samples since last successful calibration verification.	Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification, if . reanalysis is not possible.	No samples may be analyzed until the problem has been corrected.	Pg. 85-88 Level 3 Package OK
Method Blank	One per preparatory batch	No analytes detected > ½ RL. See box D-1.	Correct problem, then see criteria in box D-1; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	Lab: Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch. Validator; Apply "B" flag if result is less than 5x method blank.		Pg 18 (Cl), 20 (oPO4), 22 (SO4), 24 (Br), 89 All MBs = ND See ADR

Method Validated: 9056A | Initial Review by: J. Hartness | Date: 9/22/14 | SDG#: 280-57958-1
Senior Review by: D. Knaub | Date: 9/22/14 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Laboratory Control Sample (LCS) Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	Use laboratory in-house LCS acceptance criteria (not to exceed 20%).See Box D-3.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix G)	If corrective action fails apply J-flag to specific analyte(s) in all samples in the associated preparatory batch		Pg 18 (Cl), 20 (oPO4), 22 (SO4), 24 (Br), 90,91 LCS/LCSD = OK See ADR
Matrix Spike (MS)	One MS per preparatory batch per matrix (see box D- 7)	For matrix evaluation, use laboratory in-house LCS acceptance criteria (not to exceed 20%).	Examine the project-specific 000s. Contact the client as to additional measures to be taken,	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	None in this SDG
Matrix Spike Duplicate (MSD) or Sample Duplicate	One per preparatory batch per matrix	RPD ≤15% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	NA
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤10%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		No field duplicate collected

Method Validated: 9056A

Initial Review by: J. Hartness Date: 9/22/14

Senior Review by: D. Knaub Date: 9/22/14

SDG#: 280-57958-1

Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between LOD and LOQ. Validator flags: If using AFCEE; Apply "F" flag		No detections between LOD and LOQ
QC Blanks (Equipment Blanks and Field Blanks)	Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B".		Not collected

Method Validated: 6010 | Initial Review by: J. Hartness | Date: 9/22/14 | SDG#:280-57958-1
Senior Review by: D. Knaub | Date: 9/22/14 | Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETRY (METHOD 6010)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	Ok
Instrument Detection Limit (IDL) Study	At initial set-up and after significant change in instrument type, personnel, test method, or sample matrix	IDL shall be ≤ Limit of Detection (LOD)	NA	NA		p. 67-68 6/11/13
Container, Preservation, and Holding Time	All field samples	Water: 500 ml Poly, HNO_3 to pH < 2, Cool to 6°C, Soil: 4 oz glass or poly jar, Cool to 6°C 180 days to analysis	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collection date: 7/18/14 Prep; 7/30/14 Analysis date: 8/07/14, 8/12/14 Temp: 2.6°C OK

Method Validated: 6010 | Initial Review by: J. Hartness | Date: 9/22/14 | SDG#:280-57958-1
Senior Review by: D. Knaub | Date: 9/22/14 | Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETRY (METHOD 6010)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Initial calibration (ICAL) for all analytes (minimum one high standard and a calibration blank)	Daily ICAL prior to sample analysis	If more than one calibration standard is used, r ≥ 0.995.	Correct problem then repeat ICAL.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.	p. 77 run log ICIS analyzed 8/07/2014 16:03 IC analyzed 8/07/2014 16:07 and 16:11 ICVH 8/07/2014 16:20 p. 79 run log ICIS analyzed 8/12/2014 17:11 IC analyzed 8/12/2014 17:14 and 17:17 ICVH 8/12/2014 17:28
Second Source Calibration Verification (ICV)	Once after each ICAL, prior to beginning sample run	Value of second source for all analytes within ± 10% of true value	Correct problem and verify second source standard. Rerun ICV. If that fails, correct problem and repeat ICAL.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	p. 45 ICVH 280-238102/6 8/7/2014 All OK p. 46,47 ICV 280-238102/7,8 8/7/2014 All OK p. 48 ICV 280-238726/6 8/12/2014 All OK p. 49-51ICV 280-238726/8,10 8/12/2014 All OK
Continuing Calibration Verification (CCV)	After every 10 field samples and at the end of the analysis sequence	All analytes within ± 10% of true value	Correct problem, rerun CCV. If that fails, then repeat ICAL. Reanalyze all samples since last successful calibration verification	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q-flag to all results for the specific analyte(s) of interest in all samples since the last acceptable CCV. Validator flags: If using AFCEE; Apply "J" flag only if reanalysis cannot be performed	Problem must be corrected. Results may not be reported without a valid CCV. Flagging is only appropriate in cases where the samples cannot be reanalyzed.	p. 45-47 CCV 280-238102 8/7/2014 All OK p. 47 CCVL 280-238102/60 8/7/2014 NA=120% ***No flag: samples high level*** p. 48-51 CCV 280-238726 8/12/2014 All OK

Method Validated: 6010 | Initial Review by: J. Hartness | Date: 9/22/14 | SDG#:280-57958-1
Senior Review by: D. Knaub | Date: 9/22/14 | Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETRY (METHOD 6010)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Low-level calibration check standard	Daily, after one-point ICAL	Within ± 20% of true value	Correct problem, then reanalyze	Flagging criteria are not appropriate.	No samples may be analyzed without a valid low-level calibration check standard. Low-level calibration check standard should be less than or equal to the reporting limit.	p. 52 ***All OK***
Linear dynamic range or high-level check standard	Every 6 months	Within ±10% of expected value	NA	NA		p. 75 7/21/2014
Method Blank	One per preparatory batch	No analytes detected > ½ RL and greater than 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL (see Box D-1).	Correct problem, then see criteria in box D-1; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch	Problem must be corrected. Results may not be reported without a valid method blank. Flagging is only appropriate in cases where samples cannot be reanalyzed.	p. 12 & 55, 56 MB-280-2336485/1-A Ca = 106J x 5 =530 ug/L **Calcium was detected in samples at 5x greater than MB: No qualification required** ***See ADR***
Calibration blank	Before beginning a sample run, after every 10 samples, and at end of the analysis sequence	No analytes detected > LOD	Correct problem. Reprep and reanalyze calibration blank. All samples following the last acceptable calibration blank must be reanalyzed	Apply B-flag to all results for specific analyte(s) in all samples associated with the blank.		p. 53(Ca, Fe, Mg, Mn, NA) CCB 280-238102/59 Na = 229J x 5 = 1145 ug/L **Sodium was detected in samples at 5x greater than ICB: No qualification required** p. 54 (K) ICB, CCBs 280-238726 All ND

Method Validated: 6010 | Initial Review by: J. Hartness | Date: 9/22/14 | SDG#:280-57958-1
Senior Review by: D. Knaub | Date: 9/22/14 | Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETRY (METHOD 6010)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Interference check solutions (ICS-A and ICS-AB)	At the beginning of an analytical run and every 12 hours	ICS-A: Absolute value of concentration for all non-spiked analytes < LOD (unless they are a verified trace impurity from one of the spiked analytes) ICS-AB: Within ±20% of expected value	Terminate analysis, locate and correct problem, reanalyze ICS, reanalyze all samples.	If corrective action fails, apply Q-flag to all results for specific analyte(s) in all samples associated with the ICS. Validator flags: If using AFCEE; Apply "M" flag		p. 57 ICS-A Mn & Na >LOD ***No qualification- vendor verified trace impurities and samples do not have Al, Ca, Fe, or Mg at levels > ICS*** p. 58 ICS-AB :All OK
Laboratory Control Sample (LCS) Containing All Analytes to be Reported	One per preparatory batch	QC acceptance criteria specified by DoD, if available; see box D-3 and Appendix G.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix G)	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch Validator flags: If using AFCEE; Apply "J" flag	Problem must be corrected. Results may not be reported without a valid LCS. Flagging is only appropriate in cases where the samples cannot be reanalyzed.	p. 13 LCS-280-2336485/2-A ***All OK*** ***See ADR***
Matrix Spike (MS)	One per preparatory batch per matrix (see box D-7)	For matrix evaluation, use QC acceptance criteria specified by DoD for LCS.	Examine the project-specific DQOs. If the matrix spike falls outside of DoD criteria, additional quality control test (dilution test and post-digestion spike addition) are required to evaluate matrix effects.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	p. 15-16 ST012-W30-NABRSOL Ca = 64%, 86% Fe = 63%, 92% Mn = 57%, 79% K = 280%, 85% ***No qualification: sample result is greater than 4x spike amount or MS/MSD was within QC limits*** ***See ADR***

Method Validated: 6010 | Initial Review by: J. Hartness | Date: 9/22/14 | SDG#:280-57958-1
Senior Review by: D. Knaub | Date: 9/22/14 | Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETRY (METHOD 6010)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Matrix Spike Duplicate (MSD)	One per preparatory batch per matrix (see Box D-7)	MSD: For matrix evaluation use QC acceptance criteria specified by DoD for LCS MSD RPD < 20%	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	Pg. 15 ST012-W30-NABRSOL ***RPDs are ok*** ***See ADR***
Dilution test	Once per preparatory batch	Five-fold dilution must agree within ± 10% of the original measurement	Perform post-digestion spike addition.	Flagging criteria are not appropriate.	Only applicable for samples with concentrations > 50 x LOQ.	Pg. 17 ST012-W30-NABRSOL ***OK***
Post digestion spike addition	When dilution test fails or analyte concentration for all samples < 50 x LOQ	Recovery within 75-125% of (see Table B-1)	Run all associated samples in the preparatory batch by method of standard additions (MSA) or see flagging criteria.	For specific analyte(s) in the parent sample, apply J-flag of acceptance criteria are not met.	Spike addition should produce a concentration of 10 - 100 x LOQ	Pg. 14 Ca = 55% Mg = 73% Mn = -424% K = -275% ***No qualification: sample result is greater than 4x spike amount or MS/MSD was within QC limits***
Method of standard additions (MSA)	When matrix interference is suspected	NA	NA	NA	Document use of MSA in the case narrative.	NA
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD 20%	Qualify samples	For the specific analyte(s) in the parent & dup samples, apply J-flag if acceptance criteria are not met.		No field dups analyzed for metals
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between DL and LOQ. Validator flags: If using AFCEE; Apply "F" flag		No results reported between MDL and RL.
QC Blanks (Equipment Blanks, and Field Blanks)	Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value are qualified as estimated and flagged "B".		No EB blanks

Data Evaluation Narrative
AMEC Project: Former Williams AFB
AMEC Project Number: 9101110001.5300.5301
Site: ST012 – Enhanced Bioremediation Field Test
Sampling Event: July 2014
Matrix: Groundwater

SDG: 280-58001-1

1.0 INTRODUCTION

A data quality evaluation (DQE) was performed on the data reported for the Enhanced Bioremediation field test conducted at Site ST012 in July 2014, at the former Williams Air Force Base (AFB), Mesa, Arizona. The following sections provide summary discussions of the required data qualifications for each site and analytical methods for samples collected at the former WAFB. Data validation was conducted on 100% of the primary samples and field quality control samples (trip blanks, rinsate blanks, sample duplicates, and matrix spike/matrix spike duplicate [MS/MSD] samples). A Level III (Step IIB) data validation was performed using supplemental checklists to review the following quality control elements: laboratory case narrative, sample documentation, chain-of-custody, holding time protocols, method-specific calibration information, mass tunes, method blank results, laboratory control sample (LCS) results, surrogate recoveries (where applicable), MS/MSD recoveries and relative percent differences (RPDs), field duplicate RPDs, trip and equipment/rinsate blanks, method-specific QC elements (such as interelement check standards (ICS), serial dilutions, post digestion spikes (PDS), column breakdown, etc.), method sensitivity, and completeness.

Data were reviewed using precision and accuracy control limits presented in The Department of Defense (DoD) Quality Systems Manual (QSM) Version 4.2 (DoD, 2010). DQE data qualifications were applied if necessary in accordance with procedures in Air Force Center for Environmental Excellence (AFCEE) Quality Assurance Project Plan (QAPP), Version 4.0.01 (AFCEE, 2005), the method, and professional judgment using the following qualifiers:

J = The reported concentration is considered an estimated value due to discrepancies in meeting certain analyte-specific quality control criteria.
F = The reported concentration is between the limit of quantitation/reporting limit (LOQ/RL) and method detection limit (MDL) and is considered an estimated value
UJ = The target compound was not detected and the reporting limit is considered imprecise due to discrepancies in meeting certain analyte-specific quality control criteria.
B = The result may be biased high or a false positive based on blank data.
M = The reported concentration is estimated due to matrix effects.
R = The data are considered unusable due to discrepancies in meeting certain quality control criteria and may not be used in decision making.

2.0 DELIVERABLES

The data packages as submitted to AMEC Environment and Infrastructure, Inc. (AMEC) are complete as stipulated in the Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) for Site ST012 Enhanced Bioremediation Field Test Plan (AMEC, 2014), and the applicable guidelines described in the former Williams AFB Performance Based Remediation Program QAPP and standard operating procedures (SOPs) (collectively referred to as the QAPP/SOP [AMEC, 2012]) for U.S. States Environmental Protection Agency (EPA) Methods SW8260B, SW8015B, SW9056A, and SW6010C.

3.0 SAMPLE INTEGRITY

Samples within this sample delivery group (SDG) collected from ST012 were submitted to TestAmerica Laboratories (TAL) in Denver, Colorado for select volatile organic compounds (VOCs) analysis by USEPA Method SW8260B, total petroleum hydrocarbons-gasoline range organics (TPH-GRO) and diesel range organics (TPH-DRO) by Method SW8015B, anions by Method SW9056A and select metals by Method SW6010C.

Based on the information provided on the cooler receipt forms, samples arrived at the laboratory outside the recommended temperature requirements (17.6°C) due to a delay in shipment to the laboratory by Federal Express.

Action: The VOC, TPH-GRO, and TPH-DRO results reported for the samples were qualified as estimated, with a possible low bias and flagged "J/UJ". The metals and anions data were not qualified for temperature exceedence.

Completed Chain-of-Custody (COC) documents are included in the data package.

4.0 SAMPLE IDENTIFICATION

This SDG contains the following water and quality control (QC) samples:

Site: ST012	**QC Samples**
ST012-W11-WG-0714	ST012-DUP01-071614
ST012-W30-WG-0714	TB01-071614

These samples were collected on 16 July 2014. Sample ST012-DUP01-071614 is a field duplicate of sample ST012-W30-WG-0714.

5.0 SAMPLE QUALIFICATION

Only those components that required qualification of the data are presented in this narrative. All Level III components were within the DoD QSM QC limits, with the following exceptions:

- Samples were received outside the recommended temperature range and VOC, TPH-GRO and TPH-DRO results were flagged "J/UJ".
- Samples were received outside the holding time for orthophosphate and flagged "UJ".
- Constituents were present in the associated blanks and flagged "B".
- Surrogate recoveries were outside QC limits (no flags applied).
- Metals were detected in the Interference Check Solution A (ICSA) (no qualification required).
- MS/MSD recoveries were outside QC limits resulting in "J" flags.
- PDS recoveries were outside QC limits for two metals (no flags applied).
- Field and laboratory duplicate precision was outside QC limits and results were flagged "J".
- Results were present between the MDL and LOQ and flagged "F".

6.0 VOCS (SW8260B)

Samples collected from site ST012 were submitted for VOCs by EPA Method SW8260B and analyzed for site-specific VOC compounds of interest (COIs).

A Level III validation was performed on this method and only those components that exceeded the QAPP/SOP criteria are presented below. Each of the Level III components was within the QAPP/SOP QC criteria; however the following qualification was noted:

- Samples were received outside the recommended temperature range and VOCs were flagged "J/UJ".
- Constituents were present in the associated blanks and flagged "B".
- Field duplicate precision was outside QC limits and results were flagged "J".
- Results were present between the MDL and RL and flagged "F".

6.1 Receipt Condition

The samples were received out of temperature requirements and qualified as estimated (J/UJ) with a possible low bias. See Section 3.0 *Sample Integrity* for details.

6.2 Method Blank and Trip Blank

The method blanks for this SDG contained naphthalene (0.507 J micrograms per liter [µg/L]) and methylene chloride (0.489 J µg/L), and the trip blank contained naphthalene (0.43 J µg/L). Any associated sample with results less than 5x (10x for common contaminants) the method or trip blank results were considered as possibly biased high or false positive and flagged "B". The 5x/10x rule was applied to the raw response in the sample prior to dilution and sample volume calculations.

Action: The naphthalene results in the trip blank sample TB01-071614 and the methylene chloride results in groundwater sample ST012-DUP01-071614 were qualified as estimated with a possible high bias and flagged "B".

6.3 Field Duplicates

One duplicate pair was collected and analyzed for VOCs: ST012-DUP01-071614/ST012-W30-WG-0714. The relative percent difference (RPD) between the parent and duplicate was exceeded for naphthalene. Positive sample results above the LOQ were qualified.

Action: The naphthalene results for the primary sample and the duplicate were qualified as estimated and flagged "J". As mentioned above, results were previously flagged for temperature exceedence and no additional qualification was necessary.

6.4 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of VOCs by USEPA Method SW 8260B except where dilutions were required to place the constituent within the calibration range. Dilutions were required. The laboratory indicated a dilution with a "D" qualifier which was subsequently removed during the validation process.

Any result reported between the LOQ and MDL is considered a quantitative estimate. The results reported between the RL and MDL are presented in the attached data report.

Action: The associated results reported between the LOQ and MDL were qualified as estimated and flagged "F" unless overridden by other QC criteria.

7.0 TPH-GRO (8015B)

Samples collected from Site ST012 were submitted for TPH-GRO analysis by EPA Method SW8015B. A Level III validation was performed on this method and only those components that exceeded the program document QAPP/SOP criteria are presented below. Qualification was required for the following:

- Samples were received outside the recommended temperature range and results were flagged "J/UJ".
- Surrogate recoveries were outside QC limits (no flags applied).

7.1 Receipt Condition

The samples were received out of temperature requirements and qualified as estimated (J/UJ) with a possible low bias. See Section 3.0 *Sample Integrity* for details.

7.2 Surrogate Recoveries

Surrogate a,a,a-trifluorotoluene recovered above the QC limits in samples ST012-W11-WG-0714 and ST012-W30-WG-0714. No qualification is required if the samples were diluted or the surrogate recoveries were high and the samples were non-detect.

Action: No qualification was required because the samples were diluted.

7.3 Limits of Quantitation

The LOQ as specified in the QAPP/SOP (AMEC, 2012) was met for samples submitted for the analysis of TPH-GRO by EPA Method SW8015B except where dilutions were required to place the constituent within the calibration range. Samples reported with this SDG required dilution due to high levels of TPH-GRO. The laboratory indicated a dilution with a "D" qualifier which was subsequently removed during the validation process.

8.0 TPH-DRO (8015B)

Samples collected from Site ST012 were submitted for TPH-DRO analysis by EPA Method SW8015B. A Level III validation was performed on this method and only those components that exceeded the program document QAPP/SOP criteria are presented below. Qualification was required for the following:

- Samples were received outside the recommended temperature range and results were flagged "J/UJ".
- Constituents were present in associated blanks and flagged "B".

8.1 Receipt Condition

The samples were received out of temperature requirements and qualified as estimated (J/UJ) with a possible low bias. See Section 3.0 *Sample Integrity* for details.

8.2 Method Blank

The method blanks for this SDG contained TPH-DRO (0.174 J milligrams per liter [mg/L], respectively). Any associated sample with results less than 5x the method blank results were considered as possibly biased high or false positive and flagged "B". The 5x rule was applied to the raw response in the sample prior to dilution and sample volume calculations.

Action: The TPH-DRO results in both the groundwater samples were qualified as estimated with a possible high bias and flagged "B".

8.3 Limits of Quantitation

The LOQ as specified in the QAPP/SOP (AMEC, 2012) was met for samples submitted for the analysis of TPH-DRO by EPA Method SW8015B. Dilutions were not required for TPH-DRO.

9.0 ANIONS (SW9056A)

Samples collected from site ST012 were submitted for Anions by Method SW9056A. A Level III validation was performed on this method and only those components that exceeded the QAPP/SOP criteria are presented below. Each of the Level III components was within the QAPP/SOP QC criteria; however the following qualification was noted:

- Samples were received outside the holding time for orthophosphate and flagged "UJ".

- MS/MSD recoveries were outside QC limits for bromide resulting in "J" flags.
- Laboratory duplicate RPD exceeded Qc limits and results were flagged "J".

9.1 Holding Times

The samples were received at the laboratory after the holding time for orthophosphate had expired due to a Federal Express delay in shipping.

Action: The orthophosphate results were considered estimated with a possible low bias and flagged "UJ".

9.2 Matrix Spike/Matrix Spike Duplicate

The laboratory performed MS/MSD on both samples in this SDG for anions. The recovery for bromide in sample ST012-W11-WG-0714 recovered above the QC limit and the recovery for chloride in sample ST012-W30-WG-0714 recovered below the QC limit in the MS/MSD samples. No qualification is required if the recoveries were high and the samples were non-detect or the analyte was present in the sample at concentrations greater than 4x the spike amount.

Action: The bromide results in sample ST012-W11-WG-0714 were qualified as estimated with a possible high bias and flagged "J". No qualification was required for chloride in sample ST012-W30-WG-0714 because it was present in the sample at greater than 4x the spike amount.

9.3 Laboratory Duplicate

The laboratory performed duplicate analyses on both samples in this SDG. The RPD between sample ST012-W11-WG-0714 and the laboratory duplicate was exceeded for sulfate. Positive sample results above the LOQ were qualified.

Action: The sulfate results in sample ST012-W11-WG-0714 were qualified as estimated and flagged "J".

9.4 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of Anions by USEPA Method SW 9056A with the exception of analytes that required dilution. Both samples in this SDG required dilution for chloride resulting in elevated LOQs. The laboratory indicated a dilution with a "D" qualifier which was subsequently removed during the validation process.

10.0 METALS (SW6010C)

Samples collected from Site ST012 were submitted for the major metal cations by EPA Method SW6010C. Samples were analyzed for calcium, iron, magnesium, manganese, potassium, and sodium. A Level III validation was performed on this method and only those components that required qualification of the data are presented in this narrative. All Level III validation was

performed on this method and only those components that exceeded the SAP/TAL SOP criteria are presented below. The following components exceeded the QC criteria or were noted:

- Constituents were present in the associated blanks and flagged "B" (no flags applied).
- Metals were detected in the Interference Check Solution A (ICSA) (no qualification required).
- PDS recoveries were outside QC limits for two metals (no flags applied).
- Results were present between the MDL and LOQ and flagged "F".

10.1 Method Blanks

One method blank showed the presence of calcium (113 J µg/L) and sodium (111 J µg/L). Associated sample results less than 5x the blank value were qualified as estimated and flagged "B".

Action: No qualification was required because the associated calcium and sodium results in the samples were greater than 5 x the blank value.

10.2 Interference Check Solution A (ICSA)

Manganese was detected in the ICSA solution associated with prep batch 280-235312. The vendor verified that the ICSA contained these trace impurities.

Action: No qualification is required for impurities verified by the vendor.

10.3 Post Digestion Spike

The laboratory performed a PDS on sample ST012-W11-WG-0714 and the recovery for calcium and manganese in sample recovered below the QC limit. No qualification is required if the recoveries were high and the samples were non-detect or the analyte was present in the sample at concentrations greater than 4x the spike amount.

Action: No qualification was required for calcium and manganese results in sample ST012-W11-WG-0714 because the metals were present in the sample at greater than 4x the spike amount.

10.4 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of metals by USEPA Method SW6010C except where dilutions were required to place the constituent concentration within the calibration range. No Dilutions were required.

Any result reported between the LOQ and MDL is considered a quantitative estimate. The results reported between the RL and MDL are presented in the attached data report.

Action: The associated results reported between the LOQ and MDL were qualified as estimated and flagged "F" unless overridden by other QC criteria.

11.0 OVERALL SITE EVALUATION AND PROFESSIONAL JUDGMENT

Edits to the DQE qualifiers by professional judgment were not required.

12.0 SUMMARY OF DATA QUALITY INDICATORS

This section provides an assessment of the data based on project data quality indicators (DQIs) described on QAPP Worksheet #37 of the Program Document QAPP/SOP (AMEC, 2012). The DQIs consist of precision, accuracy, representativeness, comparability, completeness, and sensitivity.

12.1 Precision

An assessment of precision of analytical data is accomplished via review of field duplicate and MS/MSD analyses. Field duplicate and MS/MSD analyses are used to assess field variability, which includes sample collection/handling as well as matrix homogeneity. Precision is expressed as the relative percent difference (RPD) between results for duplicate pairs.

Field duplicate sample samples were submitted for VOCs and the RPD was exceeded for naphthalene most likely due to the different dilutions applied to the samples; therefore, impacts to DQOs are minimal. A MS/MSD was performed on project samples for anions and metals and the RPDs were within QC limits. Additionally, the laboratory performed a duplicate analysis for anions and the RPD was exceeded for sulfate resulting in qualification for sulfate in one sample. Precision for TPH-GRO and TPH-DRO was evaluated through the analysis of the LCS/LCSD and the RPDs were compliant with the QAPP/SOP. Even though two naphthalene results and one sulfate result were qualified as estimated, the overall method and sample matrix precision are acceptable and achieve project objectives.

12.2 Accuracy (Bias)

An assessment of accuracy of analytical data is accomplished via evaluation of the spike recoveries in the MS/MSD, LCS, post digestion spike samples, and surrogate spike compounds, in addition to calibration criteria. Accuracy is expressed as percent recovery. Accuracy data were compliant with the QAPP/SOP with the exception TPH-GRO surrogates and MS/MSD recoveries for bromide in one sample. The DQE resulted in the qualification of bromide results as estimated in one sample. Estimated data is usable data and all remaining accuracy data for the other anions, VOCs, TPH-GRO, TPH-DRO, and metals were within QC limits or did not require qualification. Therefore, the data results indicate method and matrix accuracy is acceptable to achieve project objectives.

12.3 Representativeness

Representativeness for the analytical data is determined through evaluation of the associated blank data and evaluation of appropriate sample handling procedures. All samples were properly stored and preserved in the field and at TestAmerica; however, due to a Federal Express shipping delay samples were received at the laboratory above temperature requirements and the holding time was exceeded for orthophosphate. The temperature exceedence resulted in the qualification of the VOC, TPH-GRO and TPH-DRO results with a

possible low bias and the orthophosphate results were qualified as possibly low due to the holding time exceedence.

Method blanks and trip blanks contained low-levels of naphthalene, methylene chloride, TPH-DRO and/or metals which resulted in the qualification of low-level naphthalene, methylene chloride and TPH-DRO results in one or more of the samples. The targets qualified in the groundwater samples are at such low levels, that the impact to DQOs is minimal. Due to the qualifications, the analytical results indicate sample data for VOCs, TPH-GRO, TPH-DRO, and orthophosphate may be biased low and may not be truly representative of the Site conditions.

12.4 Comparability

Comparability addresses the confidence with which one data set can be compared to another. Use of appropriate sampling methods, COC procedures, and EPA-approved analytical methods, as well as adherence to strict QA/QC procedures, provide the basis for uniformity in sample collection and analysis. Analytical data were generated by TestAmerica using standard reporting units of micrograms per liter for VOCs, TPH-GRO, and metals and milligrams per liter for TPH-DRO and anions. In addition, sample collection and analytical method protocols were implemented in accordance with approved, documented procedures. Analytical data are determined to be comparable to previous Site results; however, due to shipping delays may be biased low.

12.5 Completeness

Completeness of the field sampling activities were assessed in terms of the actual number and type of sample results received from the field and laboratory, as compared with the planned number and type of sample results. All samples planned were collected which meets a field completeness of 100%.

Analytical completeness of data is a measure of the number of valid project-specific data results obtained in comparison to the total number of data results projected to achieve project DQOs. Valid data are defined as data that meet the project-specific DQOs. No data were rejected as a result of the data validation; however, some of the results were qualified as estimated. Estimated data is usable data. The completeness goals met the 90 percent goal for field and laboratory data expected for this project.

12.6 Sensitivity

Analytical methods and RLs were implemented in accordance with the QAPP/SOP and EPA promulgated methodologies. Method RLs were achieved for the event except when sample dilutions were required to bring target compounds within the linear range of the instrument calibration. As previously mentioned, the samples within this SDG required dilutions for VOCs, TPH-GRO, and chloride to place the results within the calibration range. These include modified RLs for selected detections; therefore, sensitivity requirements were met for non-diluted constituents.

12.7 Usability Summary

The data generated during the July 2014 sampling event required qualification and the analytical results indicate sample data for VOCs, TPH-GRO, TPH-DRO, and orthophosphate may be biased low and may not be truly representative of the Site conditions. The DQOs for the Enhanced Bioremediation Field Test is to produce data to support design of anaerobic methods for the ST012 remedy if selected.

13.0 REFERENCES

AFCEE, 2005. Quality Assurance Project Plan, Version 4.0.01, May, 2005.

AMEC, August 11, 2014. *Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) (Enhanced Bioremediation Field Test Plan) Operable Unit 2 Site ST012 - Liquid Fuels Storage Area, Former Williams Air Force Base, Mesa, Arizona*.

AMEC, February 23, 2012. *Performance Based Remediation Program Quality Assurance Project Plan (QAPP) and Standard Operating Procedures (SOPs) (QAP/SOP), Former Williams Air Force Base, Mesa, Arizona*.

DoD, 2010. Department of Defense Quality System Manual, Version 4.2 Final, October 2010.

Prepared/Date: JAH 8/27/2014
Checked/Date: DWK 8/29/2014

Flagged Data Reports

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-58001-1

Client Sample ID: ST012-W11-WG-0714

Lab Sample ID: 280-58001-1 Date Sampled: 07/16/2014 1245
Client Matrix: Water Date Received: 07/21/2014 0845

8260B Volatile Organic Compounds (GC/MS)

Analysis Method:	8260B	Analysis Batch:	280-236589	Instrument ID:	VMS_Z
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	Z8841.D
Dilution:	1.0			Initial Weight/Volume:	20 mL
Analysis Date:	07/30/2014 1744			Final Weight/Volume:	20 mL
Prep Date:	07/30/2014 1744				

8-26-14

Analyte	Result (ug/L)	Qualifier	DL	LOQ
1,2-Dichloroethane	0.40	U J	0.13	1.0
Benzene	51	J	0.16	1.0
Methylene Chloride	0.80	U J	0.32	5.0
m-Xylene & p-Xylene	0.80	U	0.34	2.0
Naphthalene	38	B J	0.22	1.0
o-Xylene	0.40	U J	0.19	1.0
Toluene	0.38	J F	0.17	1.0
Trichloroethene (TCE)	0.21	J F	0.16	1.0
Trichlorofluoromethane	0.80	U	0.29	2.0
Xylenes, Total	1.6	U J	0.19	2.0

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	116		70 - 120
4-Bromofluorobenzene (Surr)	98		75 - 120
Dibromofluoromethane (Surr)	88		85 - 115
Toluene-d8 (Surr)	100		85 - 120

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-58001-1

Client Sample ID: **ST012-W11-WG-0714**

Lab Sample ID: 280-58001-1 Date Sampled: 07/16/2014 1245
Client Matrix: Water Date Received: 07/21/2014 0845

8260B Volatile Organic Compounds (GC/MS)

Analysis Method:	8260B	Analysis Batch:	280-236589	Instrument ID:	VMS_Z
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	Z8842.D
Dilution:	10			Initial Weight/Volume:	20 mL
Analysis Date:	07/30/2014 1807	Run Type:	DL	Final Weight/Volume:	20 mL
Prep Date:	07/30/2014 1807				

8/26/14

Analyte	Result (ug/L)	Qualifier	DL	LOQ
Ethylbenzene	310	D J	1.6	10

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	81		70 - 120
4-Bromofluorobenzene (Surr)	100		75 - 120
Dibromofluoromethane (Surr)	90		85 - 115
Toluene-d8 (Surr)	97		85 - 120

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-58001-1

Client Sample ID: **ST012-W30-WG-0714**

Lab Sample ID: 280-58001-2 Date Sampled: 07/16/2014 1515
Client Matrix: Water Date Received: 07/21/2014 0845

8260B Volatile Organic Compounds (GC/MS)

Analysis Method:	8260B	Analysis Batch:	280-236589	Instrument ID:	VMS_Z
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	Z8843.D
Dilution:	10			Initial Weight/Volume:	20 mL
Analysis Date:	07/30/2014 1830			Final Weight/Volume:	20 mL
Prep Date:	07/30/2014 1830				

8-26-14

Analyte	Result (ug/L)	Qualifier	DL	LOQ
1,2-Dichloroethane	4.0	U J	1.3	10
Ethylbenzene	290	~~D~~ J	1.6	10
Methylene Chloride	8.0	U J	3.2	50
m-Xylene & p-Xylene	8.0	U	3.4	20
Naphthalene	32	~~B D~~ J	2.2	10
o-Xylene	4.0	U J	1.9	10
Toluene	4.0	U	1.7	10
Trichloroethene (TCE)	2.0	U	1.6	10
Trichlorofluoromethane	8.0	U	2.9	20
Xylenes, Total	16	U	1.9	20

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	84		70 - 120
4-Bromofluorobenzene (Surr)	100		75 - 120
Dibromofluoromethane (Surr)	91		85 - 115
Toluene-d8 (Surr)	99		85 - 120

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-58001-1

Client Sample ID: **ST012-W30-WG-0714**

Lab Sample ID: 280-58001-2 Date Sampled: 07/16/2014 1515
Client Matrix: Water Date Received: 07/21/2014 0845

8260B Volatile Organic Compounds (GC/MS)

Analysis Method:	8260B	Analysis Batch:	280-236589	Instrument ID:	VMS_Z
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	Z8844.D
Dilution:	100			Initial Weight/Volume:	20 mL
Analysis Date:	07/30/2014 1853	Run Type:	DL	Final Weight/Volume:	20 mL
Prep Date:	07/30/2014 1853				

7-29-14

Analyte	Result (ug/L)	Qualifier	DL	LOQ
Benzene	1200	D J	16	100

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	79		70 - 120
4-Bromofluorobenzene (Surr)	95		75 - 120
Dibromofluoromethane (Surr)	88		85 - 115
Toluene-d8 (Surr)	95		85 - 120

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-58001-1

Client Sample ID: **ST012-DUP01-WG-071614**

Lab Sample ID: 280-58001-3FD Date Sampled: 07/16/2014 1530
Client Matrix: Water Date Received: 07/21/2014 0845

8260B Volatile Organic Compounds (GC/MS)

Analysis Method:	8260B	Analysis Batch:	280-236704	Instrument ID:	VMS_G2
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	G2_3444.D
Dilution:	4.0			Initial Weight/Volume:	20 mL
Analysis Date:	07/30/2014 2302			Final Weight/Volume:	20 mL
Prep Date:	07/30/2014 2302				

8-24-14

Analyte	Result (ug/L)	Qualifier	DL	LOQ
1,2-Dichloroethane	1.6	U J	0.52	4.0
Ethylbenzene	210	D J	0.64	4.0
Methylene Chloride	2.1	J D B	1.3	20
m-Xylene & p-Xylene	3.2	U J	1.4	8.0
Naphthalene	20	D J	0.88	4.0
o-Xylene	1.6	U J	0.76	4.0
Toluene	1.6	U	0.68	4.0
Trichloroethene (TCE)	0.80	U	0.64	4.0
Trichlorofluoromethane	3.2	U	1.2	8.0
Xylenes, Total	6.4	U	0.76	8.0

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	88		70 - 120
4-Bromofluorobenzene (Surr)	92		75 - 120
Dibromofluoromethane (Surr)	86		85 - 115
Toluene-d8 (Surr)	93		85 - 120

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-58001-1

Client Sample ID: **ST012-DUP01-WG-071614**

Lab Sample ID: 280-58001-3FD Date Sampled: 07/16/2014 1530
Client Matrix: Water Date Received: 07/21/2014 0845

8260B Volatile Organic Compounds (GC/MS)

Analysis Method:	8260B	Analysis Batch:	280-236589	Instrument ID:	VMS_Z
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	Z8846.D
Dilution:	40			Initial Weight/Volume:	20 mL
Analysis Date:	07/30/2014 1939	Run Type:	DL	Final Weight/Volume:	20 mL
Prep Date:	07/30/2014 1939				

Analyte	Result (ug/L)	Qualifier	DL	LOQ
Benzene	1200	D J	6.4	40

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	79		70 - 120
4-Bromofluorobenzene (Surr)	95		75 - 120
Dibromofluoromethane (Surr)	87		85 - 115
Toluene-d8 (Surr)	95		85 - 120

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-58001-1

Client Sample ID: **TB01-071614**

Lab Sample ID: 280-58001-4TB
Client Matrix: Water

Date Sampled: 07/16/2014 0000
Date Received: 07/21/2014 0845

8260B Volatile Organic Compounds (GC/MS)

Analysis Method:	8260B	Analysis Batch:	280-236589	Instrument ID:	VMS_Z
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	Z8835.D
Dilution:	1.0			Initial Weight/Volume:	20 mL
Analysis Date:	07/30/2014 1526			Final Weight/Volume:	20 mL
Prep Date:	07/30/2014 1526				

Analyte	Result (ug/L)	Qualifier	DL	LOQ
1,2-Dichloroethane	0.40	UJ	0.13	1.0
Benzene	0.20	U	0.16	1.0
Ethylbenzene	0.20	U	0.16	1.0
Methylene Chloride	0.80	U	0.32	5.0
m-Xylene & p-Xylene	0.80	U	0.34	2.0
Naphthalene	0.43	B	0.22	1.0
o-Xylene	0.40	UJ	0.19	1.0
Toluene	0.40	U	0.17	1.0
Trichloroethene (TCE)	0.20	U	0.16	1.0
Trichlorofluoromethane	0.80	U	0.29	2.0
Xylenes, Total	1.6	U	0.19	2.0

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	74		70 - 120
4-Bromofluorobenzene (Surr)	93		75 - 120
Dibromofluoromethane (Surr)	85		85 - 115
Toluene-d8 (Surr)	96		85 - 120

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-58001-1

Client Sample ID: **ST012-W11-WG-0714**

Lab Sample ID: 280-58001-1 Date Sampled: 07/16/2014 1245
Client Matrix: Water Date Received: 07/21/2014 0845

8015B_GRO Gasoline Range Organics (GRO)

Analysis Method:	8015B_GRO	Analysis Batch:	280-235828	Instrument ID:	VGC_Q
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	010F1001.D
Dilution:	5.0			Initial Weight/Volume:	5 mL
Analysis Date:	07/24/2014 1658			Final Weight/Volume:	5 mL
Prep Date:	07/24/2014 1658			Injection Volume:	5 mL

8-26-14

Analyte	Result (ug/L)	Qualifier	DL	LOQ
Gasoline Range Organics (GRO)-C6-C10	3000	~~D M~~ J	50	130

Surrogate	%Rec	Qualifier	Acceptance Limits
a,a,a-Trifluorotoluene	243	~~Q~~ *	82 - 110

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-58001-1

Client Sample ID: **ST012-W30-WG-0714**

Lab Sample ID: 280-58001-2 Date Sampled: 07/16/2014 1515
Client Matrix: Water Date Received: 07/21/2014 0845

8015B_GRO Gasoline Range Organics (GRO)

Analysis Method:	8015B_GRO	Analysis Batch:	280-235828	Instrument ID:	VGC_Q
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	011F1101.D
Dilution:	5.0			Initial Weight/Volume:	5 mL
Analysis Date:	07/24/2014 1725			Final Weight/Volume:	5 mL
Prep Date:	07/24/2014 1725			Injection Volume:	5 mL

Analyte	Result (ug/L)	Qualifier	DL	LOQ
Gasoline Range Organics (GRO)-C6-C10	3900	~~DM~~ J	50	130

Surrogate	%Rec	Qualifier	Acceptance Limits
a,a,a-Trifluorotoluene	119	~~Q~~	82 - 110

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-58001-1

Client Sample ID: **TB01-071614**

Lab Sample ID: 280-58001-4TB
Client Matrix: Water

Date Sampled: 07/16/2014 0000
Date Received: 07/21/2014 0845

8015B_GRO Gasoline Range Organics (GRO)

Analysis Method:	8015B_GRO	Analysis Batch:	280-235828	Instrument ID:	VGC_Q
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	012F1201.D
Dilution:	1.0			Initial Weight/Volume:	5 mL
Analysis Date:	07/24/2014 1752			Final Weight/Volume:	5 mL
Prep Date:	07/24/2014 1752			Injection Volume:	5 mL

8-26-14

Analyte	Result (ug/L)	Qualifier	DL	LOQ
Gasoline Range Organics (GRO)-C6-C10	20	U J	10	25

Surrogate	%Rec	Qualifier	Acceptance Limits
a,a,a-Trifluorotoluene	102		82 - 110

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-58001-1

Client Sample ID: **ST012-W11-WG-0714**

Lab Sample ID: 280-58001-1 Date Sampled: 07/16/2014 1245
Client Matrix: Water Date Received: 07/21/2014 0845

8015B_DRO Diesel Range Organics (DRO) (GC)

Analysis Method:	8015B_DRO	Analysis Batch:	280-236144	Instrument ID:	SGC_U
Prep Method:	3510C	Prep Batch:	280-235611	Initial Weight/Volume:	1053.2 mL
Dilution:	1.0			Final Weight/Volume:	1 mL
Analysis Date:	07/29/2014 0200			Injection Volume:	1 uL
Prep Date:	07/23/2014 1226			Result Type:	PRIMARY

8-26-14

Analyte	Result (mg/L)	Qualifier	DL	LOQ
Diesel Range Organics [C10-C28]	0.45	MB	0.031	0.24

Surrogate	%Rec	Qualifier	Acceptance Limits
o-Terphenyl	79	M	50 - 115

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-58001-1

Client Sample ID: **ST012-W30-WG-0714**

Lab Sample ID: 280-58001-2 Date Sampled: 07/16/2014 1515
Client Matrix: Water Date Received: 07/21/2014 0845

8015B_DRO Diesel Range Organics (DRO) (GC)

Analysis Method:	8015B_DRO	Analysis Batch:	280-236144	Instrument ID:	SGC_U
Prep Method:	3510C	Prep Batch:	280-235611	Initial Weight/Volume:	1046.3 mL
Dilution:	1.0			Final Weight/Volume:	1 mL
Analysis Date:	07/29/2014 0228			Injection Volume:	1 uL
Prep Date:	07/23/2014 1226			Result Type:	PRIMARY

8-26-14

Analyte	Result (mg/L)	Qualifier	DL	LOQ
Diesel Range Organics [C10-C28]	0.47	MB	0.031	0.24

Surrogate	%Rec	Qualifier	Acceptance Limits
o-Terphenyl	78		50 - 115

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-58001-1

Client Sample ID: **ST012-W11-WG-0714**

Lab Sample ID: 280-58001-1 Date Sampled: 07/16/2014 1245
Client Matrix: Water Date Received: 07/21/2014 0845

6010C Metals (ICP)

Analysis Method:	6010C	Analysis Batch:	280-237882	Instrument ID:	MT_026
Prep Method:	3010A	Prep Batch:	280-235312	Lab File ID:	26A080614D.asc
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	08/06/2014 2317			Final Weight/Volume:	50 mL
Prep Date:	07/28/2014 0730				

8.27.14

Analyte	Result (ug/L)	Qualifier	DL	LOQ
Calcium	310000		35	1000
Iron	63	F	22	100
Magnesium	67000		11	500
Manganese	2200		0.25	10
Potassium	7700		240	3000
Sodium	79000		92	5000

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-58001-1

Client Sample ID: **ST012-W30-WG-0714**

Lab Sample ID: 280-58001-2 Date Sampled: 07/16/2014 1515
Client Matrix: Water Date Received: 07/21/2014 0845

6010C Metals (ICP)

Analysis Method:	6010C	Analysis Batch:	280-237882	Instrument ID:	MT_026
Prep Method:	3010A	Prep Batch:	280-235312	Lab File ID:	26A080614D.asc
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	08/06/2014 2333			Final Weight/Volume:	50 mL
Prep Date:	07/28/2014 0730				

8-27-14

Analyte	Result (ug/L)	Qualifier	DL	LOQ
Calcium	240000		35	1000
Iron	650		22	100
Magnesium	52000		11	500
Manganese	2600		0.25	10
Potassium	6700		240	3000
Sodium	67000		92	5000

General Chemistry

Client Sample ID: **ST012-W11-WG-0714**

Lab Sample ID: 280-58001-1 Date Sampled: 07/16/2014 1245
Client Matrix: Water Date Received: 07/21/2014 0845

8-20-14

Analyte	Result	Qual	Units	DL	LOQ	Dil	Method
Bromide	1.6	J	mg/L	0.11	0.50	1.0	9056A
Analysis Batch: 280-237437	Analysis Date: 08/05/2014 1811						
Orthophosphate as P	0.20	U J	mg/L	0.19	0.50	1.0	9056A
Analysis Batch: 280-237432	Analysis Date: 08/05/2014 1721						
Chloride	800	D	mg/L	5.1	60	20	9056A
Analysis Batch: 280-237437	Analysis Date: 08/06/2014 0042						
Sulfate	5.4	J	mg/L	0.23	5.0	1.0	9056A
Analysis Batch: 280-237433	Analysis Date: 08/05/2014 1721						

General Chemistry

Client Sample ID: **ST012-W30-WG-0714**

Lab Sample ID: 280-58001-2 Date Sampled: 07/16/2014 1515

Client Matrix: Water Date Received: 07/21/2014 0845

Analyte	Result	Qual	Units	DL	LOQ	Dil	Method
Bromide	1.3		mg/L	0.11	0.50	1.0	9056A
Analysis Batch: 280-237437	Analysis Date: 08/05/2014 1922						
Orthophosphate as P	0.20	U J	mg/L	0.19	0.50	1.0	9056A
Analysis Batch: 280-237432	Analysis Date: 08/05/2014 1738						
Chloride	600	D	mg/L	5.1	60	20	9056A
Analysis Batch: 280-237437	Analysis Date: 08/06/2014 0100						
Sulfate	11		mg/L	0.23	5.0	1.0	9056A
Analysis Batch: 280-237433	Analysis Date: 08/05/2014 1738						

Data Quality Evaluation Checklists

Method Validated: 8260B

Initial Review by: J. Hartness Date: 8/28/14 SDG#: 280-58001-1
Senior Review by: D. Knaub Date: 8/29/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (METHODS 8260 AND 8270)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C).	QC acceptance criteria published by DoD, if available; otherwise method- specific criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	NA	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	Ok
MDL Study	At initial set-up and subsequently once per 12-month period; otherwise quarterly MDL verification checks shall be performed (see box D-18)	See 40 CFR 136B. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL verification check at higher level and set MDL higher or reconduct MDL study (see box D-18)	NA	Samples cannot be analyzed without a valid MDL.	Ok
Tuning	Prior to calibration and every 12 hours during sample analysis	Refer to method for specific ion criteria.	Retune instrument and verify. Rerun affected samples.	Flagging criteria are not appropriate	Problem must be corrected. No samples may be accepted without a valid tune.	Pg. 98-102 level III package VMS_G2, ICAL/ICV, 7/28/2014 VMS_G2, CCV, 7/30/2014 VMS_Z, ICAL/ICV/ 7/09/2014 VMS_Z, ICAL/ICV/ 5/29/2014 VMS_Z, ICAL/ICV/CCV, 7/30/2014 All ok

Method Validated: 8260B

Initial Review by: J. Hartness Date: 8/28/14 SDG#: 280-58001-1
Senior Review by: D. Knaub Date: 8/29/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (METHODS 8260 AND 8270)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Breakdown Check (DDT Method 8270C Only)	Daily prior to analysis of samples	Degradation ≤ 20% for DDT	Correct problem then repeat breakdown check	Flagging criteria are not appropriate	No samples shall be run until degradation ≤ 20%. Benzidine and pentachlorophenol should be present at their normal responses and no peak tailing should be observed.	NA
Container, Preservation, and Holding Time	All field samples	8260 – 40 ml VOA vial HCl to pH < 2, Cool to 4°C 14 days to analysis 8270 – 1 L Amber glass, Cool to 4°C 7 days to extraction 40 days to analysis	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collection date: 7/16/2014 Analysis date: 7/30/14 Temp 17.6°C Received out of temp due to FED-X shipping delay. ***Flag results "J/UJ"***

Method Validated: 8260B

Initial Review by: J. Hartness Date: 8/28/14 SDG#: 280-58001-1
Senior Review by: D. Knaub Date: 8/29/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (METHODS 8260 AND 8270)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Minimum Five-Point Initial Calibration For All Analytes (ICAL)	Initial calibration prior to sample analysis	Average response factor (RF) for SPCCs: VOCs - 0.30 for Chlorobenzene and 1,1,2,2-tetrachlorolethane. a 0.1 for chloromethane, bromoform, and 1,1-dicbloroethane. SVOCs - a 0.050. RSD for RFs for CCCs: The CCCs are vinyl chloride, 1,1-dichlorethene, chloroform, 1,2-dichloropropane, toluene, and ethylbenzene. VOCs and SVOCs - 30% and one option below; **Option 1**: RSD for each analyte ≤ 15% **Option 2**: linear least squares regression r a 0.995 **Option 3**: non-linear regression - coefficient of determination (COD) e a 0.99 (6 points shall be used for second order, 7 points shall be used for third order)	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.	Pg. 114 -127 OK VMS_G2, 7/28/2014 Pg. 128- 132 OK VMS_Z, 5/29/2014 Pg. 133-134 OK VMS_Z, 7/09/2014 Pg. 135-143 OK VMS_Z, 7/30/2014
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 25% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	Pg.144, VMS_G2 ICV 280-236135/22 (7/28/14) Pg.150 -151, VMS_Z ICV 280-227817/22 (5/29/14) Pg.155 -157, VMS_Z ICV 280-227817/22 (7/30/14) All COIs OK

Method Validated: 8260B | Initial Review by: J. Hartness | Date: 8/28/14 | SDG#: 280-58001-1
Senior Review by: D. Knaub | Date: 8/29/14 | Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (METHODS 8260 AND 8270)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL	Position shall be set using the midpoint standard of the initial calibration curve.	NA			All OK
Evaluation of Relative Retention Times (RRT)	With each sample	RRT of each target analyte in each calibration standard within ± 0.06 RRT units.	Correct problem, then rerun ICAL.			Pg. 103-106 All ok
Calibration Verification (CV)	Daily, before sample analysis, and every 12 hours of analysis time	Average RF for SPCCs: VOCs 0.30 for Chlorobenzene and 1,1,2,2-tetrachlorolethane, 0.1 for chloromethane, bromoform, and 1,1-dichloroethane. SVOCs 0.050. 2. %Difference/Drift for CCCs: VOCs and SVOCs ≤20%D (Note: D = difference when using RFs or drift when using least squares regression or non-linear calibration.)	Correct problem, then rerun CV. If that fails, repeat initial calibration. See section 5.5.10 and DoD clarification box 55.	Apply Q-flag if no sample material remains and analyte exceeds criteria.	NA	Pg.145 -148, VMS_G2 CCV 280-236704/2 (7/30/14) Pg.1 49, VMS_G2 CCV 280-236704/4 (7/30/14) Pg.155 -157, VMS_Z ICV/CCV 280-227817/22 (7/30/14) All COIs OK
Internal Standards Verification	In all field samples and standards	Retention time ± 30 seconds from retention time of the midpoint standard in the ICAL EICP area within - 50% to + 100% of ICAL midpoint standard	Inspect mass spectrometer and GC for malfunctions. Reanalysis of samples analyzed while system was malfunctioning is mandatory.	If corrective action fails in field samples, apply Q-flag to analytes associated with the non-compliant IS. Flagging criteria are not appropriate for failed standards.	Flagging criteria are not appropriate.	Pg. 103-104 ICIS 280-236135/19 All ok Pg. 105-106 ICIS 280-227817/19 All ok

Method Validated: 8260B

Initial Review by: J. Hartness Date: 8/28/14 SDG#: 280-58001-1
Senior Review by: D. Knaub Date: 8/29/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (METHODS 8260 AND 8270)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Method Blank	One per preparatory batch	No analytes detected >½ RL. For common laboratory contaminants, no analytes detected > RL.	Correct problem, then see criteria in box D-5. If required, reprep and reanalyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch.		p.44 MB 280-236589/5 Naphthalene = 0.507 x 5 = 2.5 ug/L ***Flag TB01-071614 "B"*** p.46 MB 280-236704/7 MeCl = 0.489 x 10 = 4.89 ug/L ***Flag ST012-DUP01-WG-071614 "B"*** **See ADR**
LCS Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	QC acceptance criteria specified by DoD, if available; see box D-7 and Appendix DoD-D.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. (See full explanation in Appendix DoDID.	If corrective action fails, applyIQ-flag to specific analyte(s) in all samples in the associated preparatory batch.		p.45 LCS 280-236589/4 All OK p.47 LCS 280-236704/7 All OK **See ADR**
MS	One MS per preparatory batch per matrix (see box D- 15)	For matrix evaluation, use QC acceptance criteria specified by DoD for LCS.	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	Lab: For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error	No MS/MSD submitted for method 8260B

ORGANIC ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (METHODS 8260 AND 8270)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
MSD or Sample Duplicate	One per preparatory batch per matrix	RPD ≤ 30% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	Lab: For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	NA -See above
Surrogate Spike (Analytes Identified in Appendix DoD-D)	All field and QC samples	QC acceptance criteria for LCS published by DoD, if available; otherwise method- specified criteria or laboratory's own in-house criteria.	For QC and field samples, correct problem, then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available.	For the specific analyte(s) in all field samples collected from the same site matrix as the parent, apply J-flag if acceptance criteria are not met. For QC samples, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.		p. 41 All within QC limits
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤30%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		ST012-W30-WG-0714/ ST012-DUP01-WG-071614 Naphthalene= 46% - ***flag "J"***
Results Reported Between MDL and LOQ	NA	NA	NA	Apply J-flag to all results between MDL and LOQ. Validator flags: If using AFCEE; Apply "F" flag		Samples qualified as estimated and AFCEE flagged "F"

Method Validated: 8260B

Initial Review by: J. Hartness Date: 8/28/14 SDG#: 280-58001-1
Senior Review by: D. Knaub Date: 8/29/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (METHODS 8260 AND 8270)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
QC Blanks (Trip Blanks, Equipment Blanks, and Field Blanks)	Trip Blank – one per cooler containing samples for VOCs Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B"		LF01-TB01-071614 Naphthalene = 0.43ug/L – ***flagged "B" due to method blank – no qualification required for samples.*** **See ADR**

Method Validated: 8015B (TPH-GRO) Initial Review by: J. Hartness Date: 8/27/14 SDG#:280-58001-1
Senior Review by: D. Knaub Date: 8/29/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	ok
Method Detection Limit (MDL) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly MDL verification checks shall be performed (see box 0-18)	See 40 CFR 1368. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL verification check at higher level and set MDL higher or reconduct MDL study (see box D-18).	NA	Samples cannot be analyzed without a valid MDL.	ok
Retention Time (RT) Window Width Calculated for Each Analyte and Surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 72-hour study.	NA	NA		
Breakdown Check (Endrin/ DDT Method 8081 Only)	Daily prior to analysis of samples	Degradation ≤ 15% for both Endrin and DDT.	Correct problem then repeat breakdown check.	Flagging criteria are not appropriate	No samples shall be run until degradation ≤ 15%.	NA TPH-GRO

Method Validated: 8015B (TPH-GRO) Initial Review by: J. Hartness Date: 8/27/14 SDG#:280-58001-1
Senior Review by: D. Knaub Date: 8/29/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Container, Preservation, and Holding Time	All field samples	GRO- Water: 40 ml VOA vial; HCl to pH < 2, Cool to 6°C Soil: (low-level) 5 g in 40 ml VOA w/H_2O or sodium bisulfate; Cool to 6°C (high-level) 5 g in 40 ml VOA w/methanol, Cool to 6°C, or EnCore® or equivalent (48 hrs to preservation) 14 days to analysis DRO – Water: 1 L Amber glass, Cool to 6°C Soil: 4 oz amber glass jar, Cool to 6°C Water: 7 days to extraction Soil: 14 days to extraction 40 days to analysis	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collected: 7/16/14 Temp= 17.6°C Received out of temp due to FED-X shipping delay. ***Flag samples "J/UJ"*** Analyzed: 7/24/14 ***ok***

Method Validated: 8015B (TPH-GRO) Initial Review by: J. Hartness Date: 8/27/14 SDG#:280-58001-1
Senior Review by: D. Knaub Date: 8/29/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Minimum Five-Point Initial Calibration For All Analytes (ICAL)	Initial calibration prior to sample analysis	One of the options below (except for Method 8082, which may only use Option 1 or 2): Option 1: RSD for each analyte ≤ 20% Option 2: linear least squares regression: r 2 ≥0.995 Option 3: non-linear regression: coefficient of determination (COD) r2 ≥0.99 (6 points shall be used for second order, 7 points shall be used for third order)	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed. For PCB analysis, a mixture of Aroclors 1016 and 1260 is normally used to establish detector calibration linearity, unless project-specific data suggest the presence of another Aroclor (e.g., 1232). In addition, a mid-level or lower standard for each of the remaining Aroclors is analyzed for pattern recognition and response factor.	Pg 177-178 Inst VGC_Q 3/12/14 OK
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 20% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	Pg 180 ICV 280-216544/11 3/12/14 Inst VGC_Q
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL and at the beginning of the analytical shift	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift.	NA	NA		Pg 172 STD4 280-216544/7 3/12/14 Inst VGC_Q

Method Validated: 8015B (TPH-GRO) Initial Review by: J. Hartness Date: 8/27/14 SDG#:280-58001-1
Senior Review by: D. Knaub Date: 8/29/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time Window Verification for Each Analyte and Surrogate	Each calibration verification standard	Analyte within established window	Correct problem, then reanalyze all samples analyzed since the last acceptable retention time check. If they fail, redo ICAL and reset retention time window,	Flagging criteria are not appropriate for initial verification. For CCV, apply a Q-flag to all results for analytes outside the established window.	No samples shall be run without a verified retention time window at the initial verification. For method 8015, check state methods for use of modified retention time markers with gasoline range organics (GRO) or diesel range organics (DRO).	Pg 173,183 CCVRT 280-235828/5 7/24/14 Inst VGC_Q Pg 180 ICV 280-216544/11 3/12/14 Inst VGC_Q Pg 185 CCV 280-235828/16 7/24/14 Inst VGC_Q
Calibration Verification (Initial [ICV] and Continuing [CCV])	ICV: Daily, before sample analysis CCV: After every 10 field samples and at the end of the analysis sequence	All analytes within ± 20% of expected value from the ICAL	ICV: Correct problem, rerun ICV. If that fails, repeat initial calibration. See section 5.5.10 and box 55. CCV: Correct problem then repeat CCV and reanalyze all samples since last successful calibration verification.	ICV: Flagging criteria are not appropriate. CCV: Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification, if . reanalysis is not possible.	If %D for an individual analyte is > 20%, no samples may be analyzed until the problem has been corrected.	Pg 182 CCVRT 280-235828/5 7/24/14 Inst VGC_Q Pg 184 CCV 280-235828/16 7/24/14 Inst VGC_Q
Method Blank	One per preparatory batch	No analytes detected > ½RL. For common laboratory contaminants, no analytes detected > RL.	Correct problem, then see criteria in box 0-5; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch		Pg 48 MB 280-235828/6 ND

Method Validated: 8015B (TPH-GRO) Initial Review by: J. Hartness Date: 8/27/14 SDG#:280-58001-1
Senior Review by: D. Knaub Date: 8/29/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Laboratory Control Sample (LCS) Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	QC acceptance criteria specified by DoD, if available; see box D-7 and Appendix DoD-D .	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix DoD D)	If corrective action fails apply J-flag to specific analyte(s) in all samples in the associated preparatory batch		Pg 48-49, 169 LCS/LCSD 280-235828/7,8 OK
Matrix Spike (MS)	One MS per preparatory batch per matrix (see box ID- 11)	For matrix evaluation, use QC acceptance criteria specified by DoD for LCS.	Examine the project-specific DQOs. Contact the client as to additional measures to be taken,	Lab: For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	No MS/MSD submitted with this SDG
Matrix Spike Duplicate (MSD) or Sample Duplicate	One per preparatory batch per matrix	RPD ≤30% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	Lab: For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	No MSD or lab dup performed with this SDG
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤30%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		No duplicate submitted for TPH-GRO in this SDG

Method Validated: 8015B (TPH-GRO) Initial Review by: J. Hartness Date: 8/27/14 SDG#:280-58001-1
Senior Review by: D. Knaub Date: 8/29/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Surrogate Spike (Analytes Identified in Appendix DoD-D)	All field and QC samples	QC acceptance criteria for LCS specified by DoD, if available; otherwise method- specified criteria or laboratory's own in-house criteria	For QC and field samples, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	For the specific analyte(s) in all field samples collected from the same site matrix as the parent, apply J-flag if acceptance criteria are not met. For QC samples, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	Alternative surrogates are recommended when there is obvious chromatographic interference.	Pg 168 ST012-W11-WG-0714=243% ST012-W30-WG-0714=119% ***No flags; samples diluted***
Confirmation of Positive Results (Second Column or Second Detector)	All positive results must be confirmed (in Method 8081A exclude toxaphene and technical chlordane, in Method 8015B exclude GRO, DRO, and residual range organics (RRO)).	Calibration and QC criteria same as for initial or primary column analysis. Results between primary and second column RPD ≤ 40%.	NA	Apply J-flag if RFD > 40% or Q-flag if sample is not confirmed. Discuss in the case narrative.	Report the higher of two confirmed results unless overlapping peaks are causing erroneously high results, then report the non- affected result and document in the case narrative.	NA
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between LOD and LOQ. Validator flags: If using AFCEE; Apply "F" flag		No targets detected between LOD and LOQ

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
QC Blanks (Trip Blanks, Equipment Blanks, and Field Blanks)	Trip Blank – one per cooler containing samples for volatile parameters Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B"		TB01-071614 ND

Method Validated: 8015B (TPH-DRO) Initial Review by: J. Hartness Date: 8/27/14 SDG#:280-58001-1
Senior Review by: D. Knaub Date: 8/29/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	ok
Method Detection Limit (MDL) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly MDL verification checks shall be performed (see box 0-18)	See 40 CFR 1368. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL verification check at higher level and set MDL higher or reconduct MDL study (see box D-18).	NA	Samples cannot be analyzed without a valid MDL.	ok
Retention Time (RT) Window Width Calculated for Each Analyte and Surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 72-hour study.	NA	NA		
Breakdown Check (Endrin/ DDT Method 8081 Only)	Daily prior to analysis of samples	Degradation ≤ 15% for both Endrin and DDT.	Correct problem then repeat breakdown check.	Flagging criteria are not appropriate	No samples shall be run until degradation ≤ 15%.	NA TPH-DRO

Method Validated: 8015B (TPH-DRO) Initial Review by: J. Hartness Date: 8/27/14 SDG#:280-58001-1
Senior Review by: D. Knaub Date: 8/29/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Container, Preservation, and Holding Time	All field samples	GRO- Water: 40 ml VOA vial; HCl to pH < 2, Cool to 6°C Soil: (low-level) 5 g in 40 ml VOA w/H_2O or sodium bisulfate; Cool to 6°C (high-level) 5 g in 40 ml VOA w/methanol, Cool to 6°C, or EnCore® or equivalent (48 hrs to preservation) 14 days to analysis DRO – Water: 1 L Amber glass, Cool to 6°C Soil: 4 oz amber glass jar, Cool to 6°C Water: 7 days to extraction Soil: 14 days to extraction 40 days to analysis	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collected: 7/16/14 Temp= 17.6°C Received out of temp due to FED-X shipping delay. ***Flag samples "J/UJ"*** Extracted; 7/23/14 Analyzed: 7/29/14 ***ok***

Method Validated: 8015B (TPH-DRO) Initial Review by: J. Hartness Date: 8/27/14 SDG#:280-58001-1
Senior Review by: D. Knaub Date: 8/29/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Minimum Five-Point Initial Calibration For All Analytes (ICAL)	Initial calibration prior to sample analysis	One of the options below (except for Method 8082, which may only use Option 1 or 2): Option 1: RSD for each analyte ≤ 20% Option 2: linear least squares regression: r 2 ≥0.995 Option 3: non-linear regression: coefficient of determination (COD) r2 ≥0.99 (6 points shall be used for second order, 7 points shall be used for third order)	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed. For PCB analysis, a mixture of Aroclors 1016 and 1260 is normally used to establish detector calibration linearity, unless project-specific data suggest the presence of another Aroclor (e.g., 1232). In addition, a mid-level or lower standard for each of the remaining Aroclors is analyzed for pattern recognition and response factor.	Pg 200-202 Inst SGC_U 7/16/14 OK
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 20% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	Pg 203 ICV 280-234596/11 7/16/14 Inst SGC_U
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL and at the beginning of the analytical shift	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift.	NA	NA		Pg 197 CCVRT 280-236144/4 7/28/14 Inst SGC_U

Method Validated: 8015B (TPH-DRO) Initial Review by: J. Hartness Date: 8/27/14 SDG#:280-58001-1
Senior Review by: D. Knaub Date: 8/29/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time Window Verification for Each Analyte and Surrogate	Each calibration verification standard	Analyte within established window	Correct problem, then reanalyze all samples analyzed since the last acceptable retention time check. If they fail, redo ICAL and reset retention time window,	Flagging criteria are not appropriate for initial verification. For CCV, apply a Q-flag to all results for analytes outside the established window.	No samples shall be run without a verified retention time window at the initial verification. For method 8015, check state methods for use of modified retention time markers with gasoline range organics (GRO) or diesel range organics (DRO).	Pg 204 ICV 280-234596/11 7/16/14 Inst SGC_U Pg 206 CCVRT 280-236144/4 7/28/14 Inst SGC_U Pg 208 CCV 280-236144/34 7/28/14 Inst SGC_U Pg 210 CCV 280-236144/49 7/29/14 Inst SGC_U
Calibration Verification (Initial [ICV] and Continuing [CCV])	ICV: Daily, before sample analysis CCV: After every 10 field samples and at the end of the analysis sequence	All analytes within ± 20% of expected value from the ICAL	ICV: Correct problem, rerun ICV. If that fails, repeat initial calibration. See section 5.5.10 and box 55. CCV: Correct problem then repeat CCV and reanalyze all samples since last successful calibration verification.	ICV: Flagging criteria are not appropriate. CCV: Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification, if . reanalysis is not possible.	If %D for an individual analyte is > 20%, no samples may be analyzed until the problem has been corrected.	Pg 205 CCVRT 280-236144/4 7/28/14 Inst SGC_U Pg 207 CCV 280-236144/34 7/28/14 Inst SGC_U Pg 209 CCV 280-236144/49 7/29/14 Inst SGC_U

Method Validated: 8015B (TPH-DRO) Initial Review by: J. Hartness Date: 8/27/14 SDG#:280-58001-1
Senior Review by: D. Knaub Date: 8/29/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Method Blank	One per preparatory batch	No analytes detected > ½RL. For common laboratory contaminants, no analytes detected > RL.	Correct problem, then see criteria in box 0-5; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch		Pg 50 MB 280-235611/1-A DRO=0.174 x 5 =0.87 mg/L ***Flag both samples "B"*** ***See ADR***
Laboratory Control Sample (LCS) Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	QC acceptance criteria specified by DoD, if available; see box D-7 and Appendix DoD-D .	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix DoD D)	If corrective action fails apply J-flag to specific analyte(s) in all samples in the associated preparatory batch		Pg 50-51, 194-195 LCS/LCSD 280-235611/ 2-A,3-A ***OK*** ***See ADR***
Matrix Spike (MS)	One MS per preparatory batch per matrix (see box ID- 11)	For matrix evaluation, use QC acceptance criteria specified by DoD for LCS.	Examine the project-specific DQOs. Contact the client as to additional measures to be taken,	Lab: For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	No MS/MSD submitted with this SDG
Matrix Spike Duplicate (MSD) or Sample Duplicate	One per preparatory batch per matrix	RPD ≤30% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	Lab: For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	No MSD or lab dup performed with this SDG

Method Validated: 8015B (TPH-DRO) Initial Review by: J. Hartness Date: 8/27/14 SDG#:280-58001-1
Senior Review by: D. Knaub Date: 8/29/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤30%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		No duplicate submitted for TPH-DRO in this SDG
Surrogate Spike (Analytes Identified in Appendix DoD-D)	All field and QC samples	QC acceptance criteria for LCS specified by DoD, if available; otherwise method- specified criteria or laboratory's own in-house criteria	For QC and field samples, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	For the specific analyte(s) in all field samples collected from the same site matrix as the parent, apply J-flag if acceptance criteria are not met. For QC samples, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	Alternative surrogates are recommended when there is obvious chromatographic interference.	Pg 193 **All ok** **See ADR**
Confirmation of Positive Results (Second Column or Second Detector)	All positive results must be confirmed (in Method 8081A exclude toxaphene and technical chlordane, in Method 8015B exclude GRO, DRO, and residual range organics (RRO)).	Calibration and QC criteria same as for initial or primary column analysis. Results between primary and second column RPD ≤ 40%.	NA	Apply J-flag if RFD > 40% or Q-flag if sample is not confirmed. Discuss in the case narrative.	Report the higher of two confirmed results unless overlapping peaks are causing erroneously high results, then report the non- affected result and document in the case narrative.	NA

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between LOD and LOQ. Validator flags: If using AFCEE; Apply "F" flag		No targets detected between LOD and LOQ
QC Blanks (Trip Blanks, Equipment Blanks, and Field Blanks)	Trip Blank – one per cooler containing samples for volatile parameters Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B"		No equipment blank collected for TPH-DRO

Method Validated: 6010 | Initial Review by: J. Hartness | Date: 8/27/14 | SDG#:280-58001-1
Senior Review by: D. Knaub | Date: 8/29/14 | Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETRY (METHOD 6010)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	Ok
Instrument Detection Limit (IDL) Study	At initial set-up and after significant change in instrument type, personnel, test method, or sample matrix	IDL shall be ≤ Limit of Detection (LOD)	NA	NA		p. 237 6/11/13
Container, Preservation, and Holding Time	All field samples	Water: 500 ml Poly, HNO_3 to pH < 2, Cool to 6°C, Soil: 4 oz glass or poly jar, Cool to 6°C 180 days to analysis	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collection date: 7/16/14 Prep; 7/28/14 Analysis date: 8/06/14 Temp: 17.6°C Received out of temp due to FED-X shipping delay. ***No qualification required for metals.***

Method Validated: 6010 | Initial Review by: J. Hartness | Date: 8/27/14 | SDG#:280-58001-1
Senior Review by: D. Knaub | Date: 8/29/14 | Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETRY (METHOD 6010)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Initial calibration (ICAL) for all analytes (minimum one high standard and a calibration blank)	Daily ICAL prior to sample analysis	If more than one calibration standard is used, r ≥ 0.995.	Correct problem then repeat ICAL.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.	p. 247 run log ICIS analyzed 8/06/2014 13:32 IC analyzed 8/06/2014 13:35 and 13:38 ICVH 8/06/2014 13:48
Second Source Calibration Verification (ICV)	Once after each ICAL, prior to beginning sample run	Value of second source for all analytes within ± 10% of true value	Correct problem and verify second source standard. Rerun ICV. If that fails, correct problem and repeat ICAL.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	p. 223 ICVH 280-237882/6 8/6/2014 All OK p. 224 ICV 280-237882/8,9 8/6/2014 All OK p. 226 ICV 280-237882/12 8/6/2014 All OK

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Senior Review by: D. Knaub | Date: 8/29/14 | Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETRY (METHOD 6010)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Continuing Calibration Verification (CCV)	After every 10 field samples and at the end of the analysis sequence	All analytes within ± 10% of true value	Correct problem, rerun CCV. If that fails, then repeat ICAL. Reanalyze all samples since last successful calibration verification	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q-flag to all results for the specific analyte(s) of interest in all samples since the last acceptable CCV. Validator flags: If using AFCEE; Apply "J" flag only if reanalysis cannot be performed	Problem must be corrected. Results may not be reported without a valid CCV. Flagging is only appropriate in cases where the samples cannot be reanalyzed.	p. 223 CCV 280-237882/27,39 8/6/2014 All OK p. 224 CCV 280-237882/28 8/6/2014 All OK p. 225 CCV 280-237882/40 8/6/2014 All OK p. 226 CCVL 280-237882/30 8/6/2014 Ca=112% Mn=117% K=111% NA=120% ***No flag: samples high level*** p. 226 CCVL 280-237882/42 8/6/2014 Ca=112% Mn=117% K=111% NA=120% ***No flag: samples high level***
Low-level calibration check standard	Daily, after one-point ICAL	Within ± 20% of true value	Correct problem, then reanalyze	Flagging criteria are not appropriate.	No samples may be analyzed without a valid low-level calibration check standard. Low-level calibration check standard should be less than or equal to the reporting limit.	p. 227 ***All OK***
Linear dynamic range or high-level check standard	Every 6 months	Within ±10% of expected value	NA	NA		p. 245 7/21/2014

Method Validated: 6010 Initial Review by: J. Hartness Date: 8/27/14 SDG#:280-58001-1
Senior Review by: D. Knaub Date: 8/29/14 Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETRY (METHOD 6010)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Method Blank	One per preparatory batch	No analytes detected > ½ RL and greater than 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL (see Box D-1).	Correct problem, then see criteria in box D-1; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch	Problem must be corrected. Results may not be reported without a valid method blank. Flagging is only appropriate in cases where samples cannot be reanalyzed.	p. 52 & 229 MB-280-235312/1-A Ca = 113J x 5 =565 ug/L Na = 111J x 5 = 555 ug/L **Calcium & Sodium was detected in samples at 5x greater than MB: No qualification required** ***See ADR***
Calibration blank	Before beginning a sample run, after every 10 samples, and at end of the analysis sequence	No analytes detected > LOD	Correct problem. Reprep and reanalyze calibration blank. All samples following the last acceptable calibration blank must be reanalyzed	Apply B-flag to all results for specific analyte(s) in all samples associated with the blank.		p. 228 ICB 280-2337882/29 Na = 130J x 5 = 650 ug/L **Sodium was detected in samples at 5x greater than ICB: No qualification required** p. 228 ICB 280-2337882/41 Na = 114J x 5 = 570 ug/L **Sodium was detected in samples at 5x greater than ICB: No qualification required**
Interference check solutions (ICS-A and ICS-AB)	At the beginning of an analytical run and every 12 hours	ICS-A: Absolute value of concentration for all non-spiked analytes < LOD (unless they are a verified trace impurity from one of the spiked analytes) ICS-AB: Within ±20% of expected value	Terminate analysis, locate and correct problem, reanalyze ICS, reanalyze all samples.	If corrective action fails, apply Q-flag to all results for specific analyte(s) in all samples associated with the ICS. Validator flags: If using AFCEE; Apply "M" flag		p. 230 ICS-A Mn & Na >LOD ***No qualification- vendor verified trace impurities and samples do not have Al, Ca, Fe, or Mg at levels > ICS*** p. 231 ICS-AB :All OK

Method Validated: 6010 | Initial Review by: J. Hartness | Date: 8/27/14 | SDG#:280-58001-1
Senior Review by: D. Knaub | Date: 8/29/14 | Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETRY (METHOD 6010)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Laboratory Control Sample (LCS) Containing All Analytes to be Reported	One per preparatory batch	QC acceptance criteria specified by DoD, if available; see box D-3 and Appendix G.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix G)	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch Validator flags: If using AFCEE; Apply "J" flag	Problem must be corrected. Results may not be reported without a valid LCS. Flagging is only appropriate in cases where the samples cannot be reanalyzed.	p. 52, 235 LCS-280-235312/2-A ***All OK*** ***See ADR***
Matrix Spike (MS)	One per preparatory batch per matrix (see box D-7)	For matrix evaluation, use QC acceptance criteria specified by DoD for LCS.	Examine the project-specific DQOs. If the matrix spike falls outside of DoD criteria, additional quality control test (dilution test and post-digestion spike addition) are required to evaluate matrix effects.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	p. 53-54, 232 ST012-W11-WG-0714 ***all ok*** ***See ADR***
Matrix Spike Duplicate (MSD)	One per preparatory batch per matrix (see Box D-7)	MSD: For matrix evaluation use QC acceptance criteria specified by DoD for LCS MSD RPD < 20%	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	Pg. 53-54 ST012-W11-WG-0714 ***RPDs are ok*** ***See ADR***
Dilution test	Once per preparatory batch	Five-fold dilution must agree within ± 10% of the original measurement	Perform post-digestion spike addition.	Flagging criteria are not appropriate.	Only applicable for samples with concentrations > 50 x LOQ.	Pg. 54, 236 ST012-W11-WG-0714 ***OK***
Post digestion spike addition	When dilution test fails or analyte concentration for all samples < 50 x LOQ	Recovery within 75-125% of (see Table B-1)	Run all associated samples in the preparatory batch by method of standard additions (MSA) or see flagging criteria.	For specific analyte(s) in the parent sample, apply J-flag of acceptance criteria are not met.	Spike addition should produce a concentration of 10 - 100 x LOQ	Pg. 53, 234 Ca = 70% Mn = 11% ***No qualification: sample result is greater than 4x spike amount***

Method Validated: 6010 | Initial Review by: J. Hartness | Date: 8/27/14 | SDG#:280-58001-1
Senior Review by: D. Knaub | Date: 8/29/14 | Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETRY (METHOD 6010)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Method of standard additions (MSA)	When matrix interference is suspected	NA	NA	NA	Document use of MSA in the case narrative.	NA
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD 20%	Qualify samples	For the specific analyte(s) in the parent & dup samples, apply J-flag if acceptance criteria are not met.		No field dups analyzed for metals
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between DL and LOQ. Validator flags: If using AFCEE; Apply "F" flag		Results reported between MDL and RL flagged "F" for AFCEE.
QC Blanks (Equipment Blanks, and Field Blanks)	Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value are qualified as estimated and flagged "B".		No EB blanks

Method Validated: 9056A

Initial Review by: J. Hartness Date: 8/26/14 SDG#: 280-58001-1
Senior Review by: D. Knaub Date: 8/29/14 Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	ok
Limit of Detection Determination and Verification (LOD) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOD verification checks shall be performed (see box D-13)	See 40 CFR 1368. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL / LOD verification check at higher level and set MDL higher or reconduct MDL study (see box D-13).	NA	Samples cannot be analyzed without a valid MDL.	Pg. 1209-1212 6/16/2013
Limit of Quantitation Establishment and Verification (LOQ) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOQ verification checks shall be performed (see box D-14)	Within calibration range including low standard; within method precision and accuracy.	Re-run LOQ	NA	Samples cannot be analyzed without a valid LOQ	MRL check: Level 4 Package Pg. 1208 (8/05/14) = OK

Method Validated: 9056A

Initial Review by: J. Hartness Date: 8/26/14

Senior Review by: D. Knaub Date: 8/29/14

SDG#: 280-58001-1

Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time (RT) Window Width Calculated for Each Analyte and Surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 24-hour study.	NA	NA		OK
Container, Preservation, and Holding Time	All field samples	500 ml poly, Cool to 4°C Nitrate – 48 hours Nitrite, sulfate, chloride – 28 days	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collected: 7/16/14 Temp: 17.6°C Received out of temp due to FED-X shipping delay. ***No qualification required for anions.*** Analyzed: 8/05/14, 8/06/14 ***Ortho-phosphate out of hold - Flag results "J/UJ"***
ICAL for All Analytes (Minimum Three Standards and One Calibration Blank)	Initial calibration prior to sample analysis	R ≥ 0.995	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.	Pg. 1216-1273 raw data Pg1265 Level IV Package Pg 1419 Inst: WC_IonChrom10 -7/24/14 OK Pg 1418 Inst: WC_IonChrom7 - 6/3/14 OK
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 10% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	Pg. 1199-1201 Level 4 Package 8/05/14 OK

Method Validated: 9056A

Initial Review by: J. Hartness Date: 8/26/14

Senior Review by: D. Knaub Date: 8/29/14

SDG#: 280-58001-1

Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL and at the beginning of the analytical shift	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift.	NA	NA		ICAL Pg. 1216-1273 raw data OK CCVs Pg 1274 Ok
Midrange Continuing Calibration Verification (CCV)	After every 10 field samples and at end of the analysis sequence.	All analytes within established retention time windows and within ± 10% of true value	Correct problem then repeat CCV. If that fails, then repeat ICAL. Reanalyze all samples since last successful calibration verification.	Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification, if . reanalysis is not possible.	No samples may be analyzed until the problem has been corrected.	Pg. 1199-1201 Level 4 Package 8/05/14-8/06/14 OK
Method Blank	One per preparatory batch	No analytes detected > ½ RL. See box D-1.	Correct problem, then see criteria in box D-1; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	Lab: Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch. Validator; Apply "B" flag if result is less than 5x method blank.		Pg 60,63,66,1202 All MBs = ND Pg 1199-1201: CCBs Pg 1200; Chloride in CCB 19:01: 0.315 mg/L – ***no flag; samples >5x blank amount*** See ADR

Method Validated: 9056A

Initial Review by: J. Hartness Date: 8/26/14

Senior Review by: D. Knaub Date: 8/29/14

SDG#: 280-58001-1

Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Laboratory Control Sample (LCS) Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	Use laboratory in-house LCS acceptance criteria (not to exceed 20%).See Box D-3.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix G)	If corrective action fails apply J-flag to specific analyte(s) in all samples in the associated preparatory batch		Pg 60,63,67,1206-1207 LCS/LCSD = OK See ADR
Matrix Spike (MS)	One MS per preparatory batch per matrix (see box D- 7)	For matrix evaluation, use laboratory in-house LCS acceptance criteria (not to exceed 20%).	Examine the project-specific 000s. Contact the client as to additional measures to be taken,	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	Pg 61,64,68, 1203-1204 ST012-W30-WG-0714 Cl: 60/59% ***No flag: sample results >4x spike amount*** ST012-W11-WG-0714 Br: 115/116% **Flag "J" for possible high bias.**
Matrix Spike Duplicate (MSD) or Sample Duplicate	One per preparatory batch per matrix	RPD ≤15% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	RPDs = ok
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤10%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		No field duplicate collected Pg, 62, 65, 69, 1205 Lab Dup ST012-W11-WG-0714 SO4 = 17% **flag "J"** ST012-W30-WG-0714= OK

Method Validated: 9056A

Initial Review by: J. Hartness Date: 8/26/14

Senior Review by: D. Knaub Date: 8/29/14

SDG#: 280-58001-1

Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between LOD and LOQ. Validator flags: If using AFCEE; Apply "F" flag		No detections between LOD and LOQ
QC Blanks (Equipment Blanks and Field Blanks)	Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B".		Not collected

Data Evaluation Narrative
AMEC Project: Former Williams AFB
AMEC Project Number: 9101110001.5300.5301
Site: ST012 – Enhanced Bioremediation Field Test
Sampling Event: September 2014
Matrix: Groundwater

SDG: 280-59565-1

1.0 INTRODUCTION

A data quality evaluation (DQE) was performed on the data reported for the Enhanced Bioremediation field test conducted at Site ST012 in September 2014, at the former Williams Air Force Base (AFB), Mesa, Arizona. The following sections provide summary discussions of the required data qualifications for each site and analytical methods for samples collected at the former WAFB. Data validation was conducted on 100% of the primary samples and field quality control samples (trip blanks, rinsate blanks, sample duplicates, and matrix spike/matrix spike duplicate [MS/MSD] samples). A Level III (Step IIB) data validation was performed using supplemental checklists to review the following quality control elements: laboratory case narrative, sample documentation, chain-of-custody, holding time protocols, method-specific calibration information, mass tunes, method blank results, laboratory control sample (LCS) results, surrogate recoveries (where applicable), MS/MSD recoveries and relative percent differences (RPDs), field duplicate RPDs, trip and equipment/rinsate blanks, method-specific QC elements (such as interelement check standards (ICS), serial dilutions, post digestion spikes (PDS), column breakdown, etc.), method sensitivity, and completeness. The Level III DQE checklists are attached to this narrative.

Data were reviewed using precision and accuracy control limits presented in The Department of Defense (DoD) Quality Systems Manual (QSM) Version 4.2 (DoD, 2010). DQE data qualifications were applied if necessary in accordance with procedures in Air Force Center for Environmental Excellence (AFCEE) Quality Assurance Project Plan (QAPP), Version 4.0.01 (AFCEE, 2005), the method, and professional judgment using the following qualifiers:

J = The reported concentration is considered an estimated value due to discrepancies in meeting certain analyte-specific quality control criteria.
F = The reported concentration is between the limit of quantitation/reporting limit (LOQ/RL) and method detection limit (MDL) and is considered an estimated value
UJ = The target compound was not detected and the reporting limit is considered imprecise due to discrepancies in meeting certain analyte-specific quality control criteria.
B = The result may be biased high or a false positive based on blank data.
M = The reported concentration is estimated due to matrix effects.
R = The data are considered unusable due to discrepancies in meeting certain quality control criteria and may not be used in decision making.

2.0 DELIVERABLES

The data packages as submitted to AMEC Environment and Infrastructure, Inc. (AMEC) are complete as stipulated in the Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) for Site ST012 Enhanced Bioremediation Field Test Plan (AMEC, 2014), and the applicable guidelines described in the former Williams AFB Performance Based Remediation Program QAPP and standard operating procedures (SOPs) (collectively referred to as the QAPP/SOP [AMEC, 2012]) for U.S. States Environmental Protection Agency (EPA) Methods SW8260B, SW8015B, SW9056A, and SW6010C.

3.0 SAMPLE INTEGRITY

Samples within this sample delivery group (SDG) collected from ST012 were submitted to TestAmerica Laboratories (TAL) in Denver, Colorado for select volatile organic compounds (VOCs) analysis by USEPA Method SW8260B, total petroleum hydrocarbons-gasoline range organics (TPH-GRO) and diesel range organics (TPH-DRO) by Method SW8015B, anions by Method SW9056A and select metals by Method SW6010C.

Based on the information provided on the cooler receipt forms, samples arrived at the laboratory within the recommended temperature and preservation requirements. Completed Chain-of-Custody (COC) documents are included in the data package.

4.0 SAMPLE IDENTIFICATION

This SDG contains the following water and quality control (QC) samples:

Site: ST012	QC Samples
ST012-W11-WG-090214	ST012-DUP01-090214
	TB01-090214
	ST012-EB01-090214

These samples were collected on 2 September 2014. Sample ST012-DUP01-090214 is a field duplicate of sample ST012-W11-WG-090214.

5.0 SAMPLE QUALIFICATION

Only those components that required qualification of the data are presented in this narrative. All Level III components were within the DoD QSM QC limits, with the following exceptions:

- Constituents were present in the associated blanks and flagged “B”.
- Surrogate recoveries were outside QC limits and results flagged “J”.
- Metals were detected in the Interference Check Solution A (ICSA) (no qualification required).
- PDS recoveries were outside QC limits for two metals (no flags applied).
- Field and laboratory duplicate precision was outside QC limits and results were flagged “J”.
- Results were present between the MDL and LOQ and flagged “F”.

6.0 VOCS (SW8260B)

Samples collected from site ST012 were submitted for VOCs by EPA Method SW8260B and analyzed for site-specific VOC compounds of interest (COIs).

A Level III validation was performed on this method and only those components that exceeded the QAPP/SOP criteria are presented below. Each of the Level III components was within the QAPP/SOP QC criteria; however the following qualification was noted:

- Constituents were present in the associated blanks and flagged "B".
- Surrogate recoveries were outside QC limits and results flagged "J".
- Results were present between the MDL and RL and flagged "F".

6.1 Receipt Condition

The samples were received out of temperature requirements and qualified as estimated (J/UJ) with a possible low bias. See Section 3.0 *Sample Integrity* for details.

6.2 Method Blank

The method blank for this SDG contained methylene chloride (0.1.01 J micrograms per liter [µg/L]). Any associated sample with results less than 5x (10x for common contaminants) the method blank results were considered as possibly biased high or false positive and flagged "B". The 5x/10x rule was applied to the raw response in the sample prior to dilution and sample volume calculations.

Action: The methylene chloride results in each of the samples in this SDG were qualified as estimated with a possible high bias and flagged "B".

6.3 Surrogate Recoveries

Surrogate 1,2-dichloroethane-d4 recovered above the QC limits in sample ST012-W11-WG-090214. No qualification is required if the samples were diluted or the surrogate recoveries were high and the sample results were non-detect.

Action: The detected benzene and toluene results in sample ST012-W11-WG-090214 were qualified as estimated with a possible high bias and flagged "J".

6.4 Equipment Blank and Trip Blank

The equipment blank and trip blank samples in this SDG contained methylene chloride at 0.37 J µg/L and 0.52 µg/L, respectively. Any associated sample with results less than 5x (10x for common contaminants) the blank results were considered as possibly biased high or false positive and flagged "B".

Action: The methylene chloride results for the equipment and trip blank samples were qualified as possibly biased high due to method blank contamination; therefore, no additional qualification was necessary.

6.5 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of VOCs by USEPA Method SW 8260B except where dilutions were required to place the constituent within the calibration range. Dilutions were required. The laboratory indicated a dilution with a "D" qualifier which was subsequently removed during the validation process.

Any result reported between the LOQ and MDL is considered a quantitative estimate. The results reported between the RL and MDL are presented in the attached data report.

Action: The associated results reported between the LOQ and MDL were qualified as estimated and flagged "F" unless overridden by other QC criteria.

7.0 TPH-GRO (8015B)

Samples collected from Site ST012 were submitted for TPH-GRO analysis by EPA Method SW8015B. A Level III validation was performed on this method and only those components that exceeded the program document QAPP/SOP criteria are presented below. Qualification was required for the following:

- Surrogate recoveries were outside QC limits (no flags applied).

7.1 Surrogate Recoveries

Surrogate a,a,a-trifluorotoluene recovered above the QC limits in samples ST012-W11-WG-090214 and ST012-DUP01-WG-090214. No qualification is required if the samples were diluted or the surrogate recoveries were high and the sample results were non-detect.

Action: No qualification was required because the samples were diluted.

7.2 Limits of Quantitation

The LOQ as specified in the QAPP/SOP (AMEC, 2012) was met for samples submitted for the analysis of TPH-GRO by EPA Method SW8015B except where dilutions were required to place the constituent within the calibration range. Samples reported with this SDG required dilution due to high levels of TPH-GRO. The laboratory indicated a dilution with a "D" qualifier which was subsequently removed during the validation process.

8.0 TPH-DRO (8015B)

Samples collected from Site ST012 were submitted for TPH-DRO analysis by EPA Method SW8015B. A Level III validation was performed on this method and each of the components met the program document QAPP/SOP criteria. It should be noted that the laboratory placed an "M"

qualifier on any result that was manually integrated. The "M" qualifier was subsequently removed during the data validation process.

8.1 Limits of Quantitation

The LOQ as specified in the QAPP/SOP (AMEC, 2012) was met for samples submitted for the analysis of TPH-DRO by EPA Method SW8015B. Dilutions were not required for TPH-DRO.

9.0 ANIONS (SW9056A)

Samples collected from site ST012 were submitted for Anions by Method SW9056A. A Level III validation was performed on this method and only those components that exceeded the QAPP/SOP criteria are presented below. Each of the Level III components was within the QAPP/SOP QC criteria except for the following:

- Field duplicate precision was outside QC limits and results were flagged "J".

9.1 Field Duplicates

One duplicate pair was collected and analyzed for anions: ST012-DUP01-090214/ST012-W11-WG-090214. The relative percent difference (RPD) between the parent and duplicate was exceeded for bromide. Positive sample results above the LOQ were qualified.

Action: The bromide results for samples ST012-W11-WG-090214 and ST012-DUP01-090214 were qualified as estimated and flagged "J".

9.2 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of Anions by USEPA Method SW 9056A with the exception of analytes that required dilution. Both samples in this SDG required dilution for chloride resulting in elevated LOQs. The laboratory indicated a dilution with a "D" qualifier which was subsequently removed during the validation process.

10.0 METALS (SW6010C)

Samples collected from Site ST012 were submitted for the major metal cations by EPA Method SW6010C. Samples were analyzed for calcium, iron, magnesium, manganese, potassium, and sodium. A Level III validation was performed on this method and only those components that exceeded the SAP/TAL SOP criteria are presented below. The following components exceeded the QC criteria or were noted:

- Constituents were present in the associated blanks and flagged "B" (no flags applied).
- Metals were detected in the Interference Check Solution A (ICSA) (no qualification required).
- PDS recoveries were outside QC limits for two metals (no flags applied).

- Results were present between the MDL and LOQ and flagged "F".

10.1 Continuing Calibration Blanks

Two CCBs showed the presence of low levels of magnesium (0.250 J µg/L and 0.280 µg/L). Associated sample results less than 5x the blank value were qualified as estimated and flagged "B".

Action: No qualification was required because the associated manganese results in the samples were greater than 5 x the blank value.

10.2 Interference Check Solution A (ICSA)

Manganese was detected in the ICSA solution associated with prep batch 280-241934. The vendor verified that the ICSA contained these trace impurities.

Action: No qualification is required for impurities verified by the vendor.

10.3 Post Digestion Spike

The laboratory performed a PDS on sample ST012-W11-WG-090214 and the recovery for calcium and manganese in sample recovered below the QC limit. No qualification is required if the recoveries were high and the samples were non-detect or the analyte was present in the sample at concentrations greater than 4x the spike amount.

Action: No qualification was required for calcium and manganese results in sample ST012-W11-WG-090214 because the metals were present in the sample at greater than 4x the spike amount.

10.4 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of metals by USEPA Method SW6010C except where dilutions were required to place the constituent concentration within the calibration range. No Dilutions were required.

11.0 OVERALL SITE EVALUATION AND PROFESSIONAL JUDGMENT

Edits to the DQE qualifiers by professional judgment were not required.

12.0 SUMMARY OF DATA QUALITY INDICATORS

This section provides an assessment of the data based on project data quality indicators (DQIs) described on QAPP Worksheet #37 of the Program Document QAPP/SOP (AMEC, 2012). The DQIs consist of precision, accuracy, representativeness, comparability, completeness, and sensitivity.

12.1 Precision

An assessment of precision of analytical data is accomplished via review of field duplicate and MS/MSD analyses. Field duplicate and MS/MSD analyses are used to assess field variability, which includes sample collection/handling as well as matrix homogeneity. Precision is expressed as the relative percent difference (RPD) between results for duplicate pairs.

Field duplicate sample samples were submitted and the RPD was exceeded for bromide and the associated results are considered estimated. However estimated data is usable; therefore, impacts to DQOs are minimal. An MS/MSD was performed on a project sample for metals and the RPDs were within QC limits. Precision for TPH-GRO, TPH-DRO, and anions was evaluated through the analysis of the LCS/LCSD and the RPDs were compliant with the QAPP/SOP. Even though two bromine results were qualified as estimated, the overall method and sample matrix precision are acceptable and achieve project objectives.

12.2 Accuracy (Bias)

An assessment of accuracy of analytical data is accomplished via evaluation of the spike recoveries in the MS/MSD, LCS, post digestion spike samples, and surrogate spike compounds, in addition to calibration criteria. Accuracy is expressed as percent recovery. Accuracy data were compliant with the QAPP/SOP with the exception of TPH-GRO and VOC surrogates. The DQE resulted in the qualification of 2 VOC results as estimated in one sample. Estimated data is usable data and all remaining accuracy data for the other anions, VOCs, TPH-GRO, TPH-DRO, and metals were within QC limits or did not require qualification. Therefore, the data results indicate method and matrix accuracy is acceptable to achieve project objectives.

12.3 Representativeness

Representativeness for the analytical data is determined through evaluation of the associated blank data and evaluation of appropriate sample handling procedures. All samples were properly stored and preserved in the field and at TestAmerica. Method, trip, and equipment blanks were acceptable with the exception of methylene chloride. Blank contamination resulted in qualification of the associated sample data. Based on historical results and the low-level concentrations qualified, the impacts to project DQOs were minimal; therefore, the analytical results indicate sample data are representative of the Site conditions.

12.4 Comparability

Comparability addresses the confidence with which one data set can be compared to another. Use of appropriate sampling methods, COC procedures, and EPA-approved analytical methods, as well as adherence to strict QA/QC procedures, provide the basis for uniformity in sample collection and analysis. Analytical data were generated by TestAmerica using standard reporting units of micrograms per liter for VOCs, TPH-GRO, and metals and milligrams per liter for TPH-DRO and anions. In addition, sample collection and analytical method protocols were implemented in accordance with approved, documented procedures. Analytical data are determined to be comparable to previous Site results.

12.5 Completeness

Completeness of the field sampling activities were assessed in terms of the actual number and type of sample results received from the field and laboratory, as compared with the planned number and type of sample results. All samples planned were collected which meets a field completeness of 100%.

Analytical completeness of data is a measure of the number of valid project-specific data results obtained in comparison to the total number of data results projected to achieve project DQOs. Valid data are defined as data that meet the project-specific DQOs. No data were rejected as a result of the data validation; however, some of the results were qualified as estimated. Estimated data is usable data. The completeness goals met the 90 percent goal for field and laboratory data expected for this project.

12.6 Sensitivity

Analytical methods and RLs were implemented in accordance with the QAPP/SOP and EPA promulgated methodologies. Method RLs were achieved for the event except when sample dilutions were required to bring target compounds within the linear range of the instrument calibration. As previously mentioned, the samples within this SDG required dilutions for VOCs, TPH-GRO, and chloride to place the results within the calibration range. These include modified RLs for selected detections; therefore, sensitivity requirements were met for non-diluted constituents.

12.7 Usability Summary

The data generated during the September 2014 sampling event were usable with qualifications with respect to project DQOs. The DQOs for the Enhanced Bioremediation Field Test is to produce data to support design of anaerobic methods for the ST012 remedy if selected.

13.0 REFERENCES

AFCEE, 2005. Quality Assurance Project Plan, Version 4.0.01, May, 2005.

AMEC, August 11, 2014. *Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) (Enhanced Bioremediation Field Test Plan) Operable Unit 2 Site ST012 - Liquid Fuels Storage Area, Former Williams Air Force Base, Mesa, Arizona.*

AMEC, February 23, 2012. *Performance Based Remediation Program Quality Assurance Project Plan (QAPP) and Standard Operating Procedures (SOPs) (QAP/SOP), Former Williams Air Force Base, Mesa, Arizona.*

DoD, 2010. Department of Defense Quality System Manual, Version 4.2 Final, October 2010.

Prepared/Date: DWK 10/21/14
Checked/Date: JAH 10/27/14

Flagged Data Reports

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-59565-1

Client Sample ID: **ST012-W11-WG-090214**

Lab Sample ID: 280-59565-1 Date Sampled: 09/02/2014 1340
Client Matrix: Water Date Received: 09/03/2014 0945

8260B Volatile Organic Compounds (GC/MS)

Analysis Method:	8260B	Analysis Batch:	280-242744	Instrument ID:	VMS_G2
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	G2_5010.D
Dilution:	1.0			Initial Weight/Volume:	20 mL
Analysis Date:	09/11/2014 0022			Final Weight/Volume:	20 mL
Prep Date:	09/11/2014 0022				

Analyte	Result (ug/L)	Qualifier	DL	LOQ
1,2-Dichloroethane	0.40	U Q	0.13	1.0
Benzene	45	Q J	0.16	1.0
Methylene Chloride	1.1	J B	0.32	5.0
Naphthalene	43		0.22	1.0
Toluene	1.2	Q J	0.17	1.0
Trichloroethene (TCE)	0.20	U Q	0.16	1.0
Trichlorofluoromethane	0.80	U	0.29	2.0

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	130	Q *	70 - 120
4-Bromofluorobenzene (Surr)	101		75 - 120
Dibromofluoromethane (Surr)	107		85 - 115
Toluene-d8 (Surr)	112		85 - 120

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-59565-1

Client Sample ID: **ST012-W11-WG-090214**

Lab Sample ID: 280-59565-1 Date Sampled: 09/02/2014 1340
Client Matrix: Water Date Received: 09/03/2014 0945

8260B Volatile Organic Compounds (GC/MS)

Analysis Method:	8260B	Analysis Batch:	280-242744	Instrument ID:	VMS_G2
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	G2_5011.D
Dilution:	10			Initial Weight/Volume:	20 mL
Analysis Date:	09/11/2014 0042	Run Type:	DL	Final Weight/Volume:	20 mL
Prep Date:	09/11/2014 0042				

DWK 10/8/14

Analyte	Result (ug/L)	Qualifier	DL	LOQ
Ethylbenzene	230	D	1.6	10
m-Xylene & p-Xylene	74	D	3.4	20
o-Xylene	4.0	U	1.9	10
Xylenes, Total	74	D	1.9	20

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	100		70 - 120
4-Bromofluorobenzene (Surr)	95		75 - 120
Dibromofluoromethane (Surr)	96		85 - 115
Toluene-d8 (Surr)	93		85 - 120

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-59565-1

Client Sample ID: **ST012-DUP01-090214**

Lab Sample ID: 280-59565-2FD
Client Matrix: Water

Date Sampled: 09/02/2014 1350
Date Received: 09/03/2014 0945

8260B Volatile Organic Compounds (GC/MS)

Analysis Method:	8260B	Analysis Batch:	280-242744	Instrument ID:	VMS_G2
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	G2_5012.D
Dilution:	1.0			Initial Weight/Volume:	20 mL
Analysis Date:	09/11/2014 0103			Final Weight/Volume:	20 mL
Prep Date:	09/11/2014 0103				

DWK 10/21/14

Analyte	Result (ug/L)	Qualifier	DL	LOQ
1,2-Dichloroethane	0.40	U	0.13	1.0
Benzene	44		0.16	1.0
Methylene Chloride	0.55	J B	0.32	5.0
Naphthalene	42		0.22	1.0
Toluene	1.2		0.17	1.0
Trichloroethene (TCE)	0.20	U	0.16	1.0
Trichlorofluoromethane	0.80	U	0.29	2.0

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	98		70 - 120
4-Bromofluorobenzene (Surr)	89		75 - 120
Dibromofluoromethane (Surr)	85		85 - 115
Toluene-d8 (Surr)	95		85 - 120

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-59565-1

Client Sample ID: **ST012-DUP01-090214**

Lab Sample ID: 280-59565-2FD Date Sampled: 09/02/2014 1350
Client Matrix: Water Date Received: 09/03/2014 0945

8260B Volatile Organic Compounds (GC/MS)

Analysis Method:	8260B	Analysis Batch:	280-242744	Instrument ID:	VMS_G2
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	G2_5013.D
Dilution:	10			Initial Weight/Volume:	20 mL
Analysis Date:	09/11/2014 0123	Run Type:	DL	Final Weight/Volume:	20 mL
Prep Date:	09/11/2014 0123				

DWK 10/21/14

Analyte	Result (ug/L)	Qualifier	DL	LOQ
Ethylbenzene	260	D	1.6	10
m-Xylene & p-Xylene	86	D	3.4	20
o-Xylene	4.0	U	1.9	10
Xylenes, Total	87	D	1.9	20

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	99		70 - 120
4-Bromofluorobenzene (Surr)	99		75 - 120
Dibromofluoromethane (Surr)	99		85 - 115
Toluene-d8 (Surr)	98		85 - 120

Client: AMEC Environment & Infrastructure, Inc.

Job Number: 280-59565-1

Client Sample ID: **ST012-EB01-090214**

Lab Sample ID: 280-59565-3EB
Client Matrix: Water

Date Sampled: 09/02/2014 1425
Date Received: 09/03/2014 0945

8260B Volatile Organic Compounds (GC/MS)

Analysis Method:	8260B	Analysis Batch:	280-242744	Instrument ID:	VMS_G2
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	G2_5014.D
Dilution:	1.0			Initial Weight/Volume:	20 mL
Analysis Date:	09/11/2014 0143			Final Weight/Volume:	20 mL
Prep Date:	09/11/2014 0143				

Analyte	Result (ug/L)	Qualifier	DL	LOQ
1,2-Dichloroethane	0.40	U	0.13	1.0
Benzene	0.20	U	0.16	1.0
Ethylbenzene	0.20	U	0.16	1.0
Methylene Chloride	0.37	B	0.32	5.0
m-Xylene & p-Xylene	0.80	U	0.34	2.0
Naphthalene	0.80	U	0.22	1.0
o-Xylene	0.40	U	0.19	1.0
Toluene	0.40	U	0.17	1.0
Trichloroethene (TCE)	0.20	U	0.16	1.0
Trichlorofluoromethane	0.80	U	0.29	2.0
Xylenes, Total	1.6	U	0.19	2.0

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	91		70 - 120
4-Bromofluorobenzene (Surr)	97		75 - 120
Dibromofluoromethane (Surr)	93		85 - 115
Toluene-d8 (Surr)	93		85 - 120

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-59565-1

Client Sample ID: **TB01-090214**

Lab Sample ID: 280-59565-4TB
Client Matrix: Water

Date Sampled: 09/02/2014 0900
Date Received: 09/03/2014 0945

8260B Volatile Organic Compounds (GC/MS)

Analysis Method:	8260B	Analysis Batch:	280-242744	Instrument ID:	VMS_G2
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	G2_5015.D
Dilution:	1.0			Initial Weight/Volume:	20 mL
Analysis Date:	09/11/2014 0203			Final Weight/Volume:	20 mL
Prep Date:	09/11/2014 0203				

Analyte	Result (ug/L)	Qualifier	DL	LOQ
1,2-Dichloroethane	0.40	U	0.13	1.0
Benzene	0.20	U	0.16	1.0
Ethylbenzene	0.20	U	0.16	1.0
Methylene Chloride	0.52	✓ B	0.32	5.0
m-Xylene & p-Xylene	0.80	U	0.34	2.0
Naphthalene	0.80	U	0.22	1.0
o-Xylene	0.40	U	0.19	1.0
Toluene	0.40	U	0.17	1.0
Trichloroethene (TCE)	0.20	U	0.16	1.0
Trichlorofluoromethane	0.80	U	0.29	2.0
Xylenes, Total	1.6	U	0.19	2.0

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	89		70 - 120
4-Bromofluorobenzene (Surr)	96		75 - 120
Dibromofluoromethane (Surr)	94		85 - 115
Toluene-d8 (Surr)	91		85 - 120

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-59565-1

Client Sample ID: **ST012-W11-WG-090214**

Lab Sample ID: 280-59565-1 Date Sampled: 09/02/2014 1340
Client Matrix: Water Date Received: 09/03/2014 0945

8015B_GRO Gasoline Range Organics (GRO)

Analysis Method:	8015B_GRO	Analysis Batch:	280-242714	Instrument ID:	VGC_Q
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	008F0801.D
Dilution:	10			Initial Weight/Volume:	5 mL
Analysis Date:	09/09/2014 1731			Final Weight/Volume:	5 mL
Prep Date:	09/09/2014 1731			Injection Volume:	5 mL

DMK 9/10/14

Analyte	Result (ug/L)	Qualifier	DL	LOQ
Gasoline Range Organics (GRO)-C6-C10	2700	D M Q	100	250

Surrogate	%Rec	Qualifier	Acceptance Limits
a,a,a-Trifluorotoluene	147	Q *	82 - 110

Client: AMEC Environment & Infrastructure, Inc.

Job Number: 280-59565-1

Client Sample ID: **ST012-DUP01-090214**

Lab Sample ID: 280-59565-2FD
Client Matrix: Water

Date Sampled: 09/02/2014 1350
Date Received: 09/03/2014 0945

8015B_GRO Gasoline Range Organics (GRO)

Analysis Method:	8015B_GRO	Analysis Batch:	280-242714	Instrument ID:	VGC_Q
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	009F0901.D
Dilution:	10			Initial Weight/Volume:	5 mL
Analysis Date:	09/09/2014 1756			Final Weight/Volume:	5 mL
Prep Date:	09/09/2014 1756			Injection Volume:	5 mL

Analyte	Result (ug/L)	Qualifier	DL	LOQ
Gasoline Range Organics (GRO)-C6-C10	2800	D M Q	100	250

Surrogate	%Rec	Qualifier	Acceptance Limits
a,a,a-Trifluorotoluene	149	M Q	82 - 110

Client: AMEC Environment & Infrastructure, Inc.

Job Number: 280-59565-1

Client Sample ID: **ST012-W11-WG-090214**

Lab Sample ID: 280-59565-1
Client Matrix: Water

Date Sampled: 09/02/2014 1340
Date Received: 09/03/2014 0945

8015B_DRO Diesel Range Organics (DRO) (GC)

Analysis Method:	8015B_DRO	Analysis Batch:	280-242565	Instrument ID:	SGC_U
Prep Method:	3510C	Prep Batch:	280-241972	Initial Weight/Volume:	1049.4 mL
Dilution:	1.0			Final Weight/Volume:	1 mL
Analysis Date:	09/09/2014 2148			Injection Volume:	1 uL
Prep Date:	09/04/2014 1712			Result Type:	PRIMARY

D.W.K 10/31/14

Analyte	Result (mg/L)	Qualifier	DL	LOQ
Diesel Range Organics [C10-C28]	0.56	M	0.031	0.24

Surrogate	%Rec	Qualifier	Acceptance Limits
o-Terphenyl	79	M	50 - 115

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-59565-1

Client Sample ID: **ST012-DUP01-090214**

Lab Sample ID: 280-59565-2FD Date Sampled: 09/02/2014 1350
Client Matrix: Water Date Received: 09/03/2014 0945

8015B_DRO Diesel Range Organics (DRO) (GC)

Analysis Method:	8015B_DRO	Analysis Batch:	280-242565	Instrument ID:	SGC_U
Prep Method:	3510C	Prep Batch:	280-241972	Initial Weight/Volume:	1055.9 mL
Dilution:	1.0			Final Weight/Volume:	1 mL
Analysis Date:	09/09/2014 2120			Injection Volume:	1 uL
Prep Date:	09/04/2014 1712			Result Type:	PRIMARY

DWK 10/21/14

Analyte	Result (mg/L)	Qualifier	DL	LOQ
Diesel Range Organics [C10-C28]	0.55	M	0.031	0.24

Surrogate	%Rec	Qualifier	Acceptance Limits
o-Terphenyl	80		50 - 115

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-59565-1

Client Sample ID: **ST012-W11-WG-090214**

Lab Sample ID: 280-59565-1 Date Sampled: 09/02/2014 1340
Client Matrix: Water Date Received: 09/03/2014 0945

6010C Metals (ICP)

Analysis Method:	6010C	Analysis Batch:	280-242265	Instrument ID:	MT_026
Prep Method:	3010A	Prep Batch:	280-241934	Lab File ID:	26A090514D.asc
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	09/05/2014 2059			Final Weight/Volume:	50 mL
Prep Date:	09/05/2014 0830				

Analyte	Result (ug/L)	Qualifier	DL	LOQ
Calcium	300000		35	1000
Iron	140		22	100
Magnesium	67000		11	500
Sodium	76000		92	5000

Analysis Method:	6010C	Analysis Batch:	280-242487	Instrument ID:	MT_026
Prep Method:	3010A	Prep Batch:	280-241934	Lab File ID:	26c090814.asc
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	09/08/2014 2054			Final Weight/Volume:	50 mL
Prep Date:	09/05/2014 0830				

DWK 9/21/14

Analyte	Result (ug/L)	Qualifier	DL	LOQ
Manganese	2000	Q	0.25	10
Potassium	16000		240	3000

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-59565-1

Client Sample ID: **ST012-DUP01-090214**

Lab Sample ID: 280-59565-2FD
Client Matrix: Water

Date Sampled: 09/02/2014 1350
Date Received: 09/03/2014 0945

6010C Metals (ICP)

Analysis Method:	6010C	Analysis Batch:	280-242265	Instrument ID:	MT_026
Prep Method:	3010A	Prep Batch:	280-241934	Lab File ID:	26A090514D.asc
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	09/05/2014 2112			Final Weight/Volume:	50 mL
Prep Date:	09/05/2014 0830				

Analyte	Result (ug/L)	Qualifier	DL	LOQ
Calcium	310000		35	1000
Iron	150		22	100
Magnesium	68000		11	500
Sodium	78000		92	5000

Analysis Method:	6010C	Analysis Batch:	280-242487	Instrument ID:	MT_026
Prep Method:	3010A	Prep Batch:	280-241934	Lab File ID:	26c090814.asc
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	09/08/2014 2107			Final Weight/Volume:	50 mL
Prep Date:	09/05/2014 0830				

DWK 9/21/14

Analyte	Result (ug/L)	Qualifier	DL	LOQ
Manganese	2100	-Q-	0.25	10
Potassium	16000		240	3000

General Chemistry

Client Sample ID: **ST012-W11-WG-090214**

Lab Sample ID: 280-59565-1 Date Sampled: 09/02/2014 1340
Client Matrix: Water Date Received: 09/03/2014 0945

Dwf total

Analyte	Result	Qual	Units	DL	LOQ	Dil	Method
Bromide	2.6	J	mg/L	0.11	0.50	1.0	9056A
Analysis Batch: 280-241650	Analysis Date: 09/03/2014 1838						
Orthophosphate as P	0.20	U	mg/L	0.19	0.50	1.0	9056A
Analysis Batch: 280-241649	Analysis Date: 09/03/2014 1838						
Chloride	780	D	mg/L	1.3	15	5.0	9056A
Analysis Batch: 280-241650	Analysis Date: 09/03/2014 1858						
Sulfate	6.4		mg/L	0.23	5.0	1.0	9056A
Analysis Batch: 280-241650	Analysis Date: 09/03/2014 1838						

General Chemistry

Client Sample ID: **ST012-DUP01-090214**

Lab Sample ID: 280-59565-2FD Date Sampled: 09/02/2014 1350
Client Matrix: Water Date Received: 09/03/2014 0945

DWK 10/2/14

Analyte	Result	Qual	Units	DL	LOQ	Dil	Method
Bromide	1.5	J	mg/L	0.11	0.50	1.0	9056A
Analysis Batch: 280-241650	Analysis Date: 09/03/2014 1917						
Orthophosphate as P	0.20	U	mg/L	0.19	0.50	1.0	9056A
Analysis Batch: 280-241649	Analysis Date: 09/03/2014 1917						
Chloride	780	D	mg/L	1.3	15	5.0	9056A
Analysis Batch: 280-241650	Analysis Date: 09/03/2014 1937						
Sulfate	6.6		mg/L	0.23	5.0	1.0	9056A
Analysis Batch: 280-241650	Analysis Date: 09/03/2014 1917						

Data Quality Evaluation Checklists

Method Validated: 8260B

Initial Review by: D. Knaub Date: 10/21/14 SDG#: 280-59565-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (METHODS 8260 AND 8270)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C).	QC acceptance criteria published by DoD, if available; otherwise method- specific criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	NA	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	Ok
MDL Study	At initial set-up and subsequently once per 12-month period; otherwise quarterly MDL verification checks shall be performed (see box D-18)	See 40 CFR 136B. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL verification check at higher level and set MDL higher or reconduct MDL study (see box D-18)	NA	Samples cannot be analyzed without a valid MDL.	Ok
Tuning	Prior to calibration and every 12 hours during sample analysis	Refer to method for specific ion criteria.	Retune instrument and verify. Rerun affected samples.	Flagging criteria are not appropriate	Problem must be corrected. No samples may be accepted without a valid tune.	p. 217 – 219 level IV package VMS_G2, ICAL/ICV, 8/27/14 VMS_G2, ICAL/ICV, 9/04/14 VMS_G2, CCV 9/10/14 All ok
Breakdown Check (DDT Method 8270C Only)	Daily prior to analysis of samples	Degradation ≤ 20% for DDT	Correct problem then repeat breakdown check	Flagging criteria are not appropriate	No samples shall be run until degradation ≤ 20%. Benzidine and pentachlorophenol should be present at their normal responses and no peak tailing should be observed.	NA

Method Validated: 8260B

Initial Review by: D. Knaub Date: 10/21/14 SDG#: 280-59565-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (METHODS 8260 AND 8270)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Container, Preservation, and Holding Time	All field samples	8260 – 40 ml VOA vial HCl to pH < 2, Cool to 4°C 14 days to analysis 8270 – 1 L Amber glass, Cool to 4°C 7 days to extraction 40 days to analysis	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collection date: 9/02/14 Analysis date: 9/10/14 Temp 6.7 °C
Minimum Five-Point Initial Calibration For All Analytes (ICAL)	Initial calibration prior to sample analysis	Average response factor (RF) for SPCCs: VOCs - 0.30 for Chlorobenzene and 1,1,2,2-tetrachlorolethane. a 0.1 for chloromethane, bromoform, and 1,1-dicbloroethane. SVOCs - a 0.050. RSD for RFs for CCCs: The CCCs are vinyl chloride, 1,1-dichlorethene, chloroform, 1,2-dichloropropane, toluene, and ethylbenzene. VOCs and SVOCs - 30% and one option below; **Option 1**: RSD for each analyte ≤ 15% **Option 2**: linear least squares regression r a 0.995 **Option 3**: non-linear regression - coefficient of determination (COD) e a 0.99 (6 points shall be used for second order, 7 points shall be used for third order)	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.	p. 256 VMS_G2, 8/27/14 All OK p. 296 VMS_G2, 9/04/14 (short list) All OK

Method Validated: 8260B

Initial Review by: D. Knaub Date: 10/21/14 SDG#: 280-59565-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (METHODS 8260 AND 8270)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 25% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	p. 318, VMS_G2 ICV 280-240780/14 (8/27/14) p. 325, VMS_G2 ICV (short list) 280-241807/22 (9/04/14) All OK
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL	Position shall be set using the midpoint standard of the initial calibration curve.	NA			All OK
Evaluation of Relative Retention Times (RRT)	With each sample	RRT of each target analyte in each calibration standard within ± 0.06 RRT units.	Correct problem, then rerun ICAL.			All ok
Calibration Verification (CV)	Daily, before sample analysis, and every 12 hours of analysis time	Average RF for SPCCs: VOCs 0.30 for Chlorobenzene and 1,1,2,2-tetrachlorolethane, 0.1 for chloromethane, bromoform, and 1,1-dichloroethane. SVOCs 0.050. 2. %Difference/Drift for CCCs: VOCs and SVOCs ≤20%D (Note: D = difference when using RFs or drift when using least squares regression or non-linear calibration.)	Correct problem, then rerun CV. If that fails, repeat initial calibration. See section 5.5.10 and DoD clarification box 55.	Apply Q-flag if no sample material remains and analyte exceeds criteria.	NA	p. 329, VMS_G2 CCV 280-242744/2 (9/10/14) p. 336, VMS_G2 CCV short list 280-242744/2 (9/10/14) All COIs OK

Method Validated: 8260B

Initial Review by: D. Knaub Date: 10/21/14 SDG#: 280-59565-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (METHODS 8260 AND 8270)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Internal Standards Verification	In all field samples and standards	Retention time ± 30 seconds from retention time of the midpoint standard in the ICAL EICP area within - 50% to + 100% of ICAL midpoint standard	Inspect mass spectrometer and GC for malfunctions. Reanalysis of samples analyzed while system was malfunctioning is mandatory.	If corrective action fails in field samples, apply Q-flag to analytes associated with the non-compliant IS. Flagging criteria are not appropriate for failed standards.	Flagging criteria are not appropriate.	p. 220 -221 ICIS 280-240780/11 All ok
Method Blank	One per preparatory batch	No analytes detected >½ RL. For common laboratory contaminants, no analytes detected > RL.	Correct problem, then see criteria in box D-5. If required, reprep and reanalyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch.		p.42 MB 280-242744/7 MeCl = 1.01 x 10 = 10.1 ug/L ***Flag ST012-W11-WG-090214, ST012-DUP01-WG-090214, ST012-EB01-090214, and TB01-090214 as "B"***
LCS Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	QC acceptance criteria specified by DoD, if available; see box D-7 and Appendix DoD-D.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. (See full explanation in Appendix DoDID.	If corrective action fails, applyIQ-flag to specific analyte(s) in all samples in the associated preparatory batch.		p.43 LCS 280-242744/6 All OK

Method Validated: 8260B

Initial Review by: D. Knaub Date: 10/21/14 SDG#: 280-59565-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (METHODS 8260 AND 8270)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
MS	One MS per preparatory batch per matrix (see box D- 15)	For matrix evaluation, use QC acceptance criteria specified by DoD for LCS.	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	Lab: For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error	No MS/MSD submitted for method 8260B
MSD or Sample Duplicate	One per preparatory batch per matrix	RPD ≤ 30% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	Lab: For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	NA -See above
Surrogate Spike (Analytes Identified in Appendix DoD-D)	All field and QC samples	QC acceptance criteria for LCS published by DoD, if available; otherwise method- specified criteria or laboratory's own in-house criteria.	For QC and field samples, correct problem, then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available.	For the specific analyte(s) in all field samples collected from the same site matrix as the parent, apply J-flag if acceptance criteria are not met. For QC samples, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.		p. 39 ST012-W11-WG-090214 DCA = 130 (70-120) Assoc results flagged Q by the lab qualified as "J" for positive results only.

Method Validated: 8260B

Initial Review by: D. Knaub Date: 10/21/14 SDG#: 280-59565-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (METHODS 8260 AND 8270)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤30%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		ST012-W11-WG-090214/ ST012-DUP01-WG-090214 See RPDs below
Results Reported Between MDL and LOQ	NA	NA	NA	Apply J-flag to all results between MDL and LOQ. Validator flags: If using AFCEE; Apply "F" flag		Samples qualified as estimated and AFCEE flagged "F"
QC Blanks (Trip Blanks, Equipment Blanks, and Field Blanks)	Trip Blank – one per cooler containing samples for VOCs Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B"		TB01-090214 MeCl = 0.52ug/L – ***flagged "B" due to method blank – no qualification required for samples.*** ST012-EB01-090214 MeCl = 0.37ug/L – ***flagged "B" due to method blank – no qualification required for samples.***

	ST012-W11-WG-090214	= ST012-DUP01-WG-090214	RPD
Benzene	45	44	22.5%
Ethylbenzene	230	260	12.2%
M,p-xylene	74	86	15%
Naphthalene	43	42	2.4%
Toluene	1.2 J	1.2	0.0%
Xylenes, total	74	87	16.4%

Method Validated: 8015B (TPH-GRO) Initial Review by: D. Knaub Date: 10/21/14 SDG#:280-59565-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	ok
Method Detection Limit (MDL) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly MDL verification checks shall be performed (see box 0-18)	See 40 CFR 1368. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL verification check at higher level and set MDL higher or reconduct MDL study (see box D-18).	NA	Samples cannot be analyzed without a valid MDL.	ok
Retention Time (RT) Window Width Calculated for Each Analyte and Surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 72-hour study.	NA	NA		
Breakdown Check (Endrin/ DDT Method 8081 Only)	Daily prior to analysis of samples	Degradation ≤ 15% for both Endrin and DDT.	Correct problem then repeat breakdown check.	Flagging criteria are not appropriate	No samples shall be run until degradation ≤ 15%.	NA TPH-GRO

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Container, Preservation, and Holding Time	All field samples	GRO- Water: 40 ml VOA vial; HCl to pH < 2, Cool to 6°C Soil: (low-level) 5 g in 40 ml VOA w/H_2O or sodium bisulfate; Cool to 6°C (high-level) 5 g in 40 ml VOA w/methanol, Cool to 6°C, or EnCore® or equivalent (48 hrs to preservation) 14 days to analysis DRO – Water: 1 L Amber glass, Cool to 6°C Soil: 4 oz amber glass jar, Cool to 6°C Water: 7 days to extraction Soil: 14 days to extraction 40 days to analysis	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collected: 9/02/14 Temp=6.7**°C** Analyzed: 9/09/14 ***ok***

Method Validated: 8015B (TPH-GRO) Initial Review by: D. Knaub Date: 10/21/14 SDG#:280-59565-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Minimum Five-Point Initial Calibration For All Analytes (ICAL)	Initial calibration prior to sample analysis	One of the options below (except for Method 8082, which may only use Option 1 or 2): Option 1: RSD for each analyte ≤ 20% Option 2: linear least squares regression: r 2 ≥0.995 Option 3: non-linear regression: coefficient of determination (COD) r2 ≥0.99 (6 points shall be used for second order, 7 points shall be used for third order)	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed. For PCB analysis, a mixture of Aroclors 1016 and 1260 is normally used to establish detector calibration linearity, unless project-specific data suggest the presence of another Aroclor (e.g., 1232). In addition, a mid-level or lower standard for each of the remaining Aroclors is analyzed for pattern recognition and response factor.	p. 397 Inst VGC_Q 3/12/14 OK
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 20% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	p. 426 ICV 280-216544/11 3/12/14 Inst VGC_Q
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL and at the beginning of the analytical shift	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift.	NA	NA		p. 397 ICAL

Method Validated: 8015B (TPH-GRO) Initial Review by: D. Knaub Date: 10/21/14 SDG#:280-59565-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time Window Verification for Each Analyte and Surrogate	Each calibration verification standard	Analyte within established window	Correct problem, then reanalyze all samples analyzed since the last acceptable retention time check. If they fail, redo ICAL and reset retention time window,	Flagging criteria are not appropriate for initial verification. For CCV, apply a Q-flag to all results for analytes outside the established window.	No samples shall be run without a verified retention time window at the initial verification. For method 8015, check state methods for use of modified retention time markers with gasoline range organics (GRO) or diesel range organics (DRO).	p. 427 ICV p. 433, 440 CCVs
Calibration Verification (Initial [ICV] and Continuing [CCV])	ICV: Daily, before sample analysis CCV: After every 10 field samples and at the end of the analysis sequence	All analytes within ± 20% of expected value from the ICAL	ICV: Correct problem, rerun ICV. If that fails, repeat initial calibration. See section 5.5.10 and box 55. CCV: Correct problem then repeat CCV and reanalyze all samples since last successful calibration verification.	ICV: Flagging criteria are not appropriate. CCV: Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification, if . reanalysis is not possible.	If %D for an individual analyte is > 20%, no samples may be analyzed until the problem has been corrected.	p. 432 CCVRT 280-242714/4 9/09/14 Inst VGC_Q p. 439 CCV 280-242714/19 9/09/14 Inst VGC_Q
Method Blank	One per preparatory batch	No analytes detected > ½RL. For common laboratory contaminants, no analytes detected > RL.	Correct problem, then see criteria in box 0-5; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch		p. 44 MB 280-242714/5 ND

Method Validated: 8015B (TPH-GRO) Initial Review by: D. Knaub Date: 10/21/14 SDG#:280-59565-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Laboratory Control Sample (LCS) Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	QC acceptance criteria specified by DoD, if available; see box D-7 and Appendix DoD-D .	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix DoD D)	If corrective action fails apply J-flag to specific analyte(s) in all samples in the associated preparatory batch		p. 44, LCS/LCSD 280-24214/6,7 GRO = 83, 85 OK
Matrix Spike (MS)	One MS per preparatory batch per matrix (see box ID- 11)	For matrix evaluation, use QC acceptance criteria specified by DoD for LCS.	Examine the project-specific DQOs. Contact the client as to additional measures to be taken,	Lab: For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	No MS/MSD submitted with this SDG
Matrix Spike Duplicate (MSD) or Sample Duplicate	One per preparatory batch per matrix	RPD ≤30% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	Lab: For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	No MSD performed with this SDG
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤30%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		ST012-W11-WG-090214/ ST012-DUP01-WG-090214 RPD = 3.6%

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Surrogate Spike (Analytes Identified in Appendix DoD-D)	All field and QC samples	QC acceptance criteria for LCS specified by DoD, if available; otherwise method- specified criteria or laboratory's own in-house criteria	For QC and field samples, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	For the specific analyte(s) in all field samples collected from the same site matrix as the parent, apply J-flag if acceptance criteria are not met. For QC samples, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	Alternative surrogates are recommended when there is obvious chromatographic interference.	p. 40 ST012-W11-WG-090214= 147% ST012-DUP01-WG-090214=149% ***No flags; samples diluted 10x***
Confirmation of Positive Results (Second Column or Second Detector)	All positive results must be confirmed (in Method 8081A exclude toxaphene and technical chlordane, in Method 8015B exclude GRO, DRO, and residual range organics (RRO)).	Calibration and QC criteria same as for initial or primary column analysis. Results between primary and second column RPD ≤ 40%.	NA	Apply J-flag if RFD > 40% or Q-flag if sample is not confirmed. Discuss in the case narrative.	Report the higher of two confirmed results unless overlapping peaks are causing erroneously high results, then report the non- affected result and document in the case narrative.	NA
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between LOD and LOQ. Validator flags: If using AFCEE; Apply "F" flag		No targets detected between LOD and LOQ

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
QC Blanks (Trip Blanks, Equipment Blanks, and Field Blanks)	Trip Blank – one per cooler containing samples for volatile parameters Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B"		TB01-090214 ST012-EB01-090214 Not analyzed for GRO

Method Validated: 8015B (TPH-DRO) Initial Review by: D. Knaub Date: 10/21/14 SDG#:280-59565-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	ok
Method Detection Limit (MDL) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly MDL verification checks shall be performed (see box 0-18)	See 40 CFR 1368. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL verification check at higher level and set MDL higher or reconduct MDL study (see box D-18).	NA	Samples cannot be analyzed without a valid MDL.	ok
Retention Time (RT) Window Width Calculated for Each Analyte and Surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 72-hour study.	NA	NA		
Breakdown Check (Endrin/ DDT Method 8081 Only)	Daily prior to analysis of samples	Degradation ≤ 15% for both Endrin and DDT.	Correct problem then repeat breakdown check.	Flagging criteria are not appropriate	No samples shall be run until degradation ≤ 15%.	NA TPH-DRO

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Container, Preservation, and Holding Time	All field samples	GRO- Water: 40 ml VOA vial; HCl to pH < 2, Cool to 6°C Soil: (low-level) 5 g in 40 ml VOA w/H_2O or sodium bisulfate; Cool to 6°C (high-level) 5 g in 40 ml VOA w/methanol, Cool to 6°C, or EnCore® or equivalent (48 hrs to preservation) 14 days to analysis DRO – Water: 1 L Amber glass, Cool to 6°C Soil: 4 oz amber glass jar, Cool to 6°C Water: 7 days to extraction Soil: 14 days to extraction 40 days to analysis	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collected: 9/02/14 Temp= 6.7 **°C** Extracted; 9/04/14 Analyzed: 9/09/14 ***ok***

Method Validated: 8015B (TPH-DRO) Initial Review by: D. Knaub Date: 10/21/14 SDG#:280-59565-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Minimum Five-Point Initial Calibration For All Analytes (ICAL)	Initial calibration prior to sample analysis	One of the options below (except for Method 8082, which may only use Option 1 or 2): Option 1: RSD for each analyte ≤ 20% Option 2: linear least squares regression: r 2 ≥0.995 Option 3: non-linear regression: coefficient of determination (COD) r2 ≥0.99 (6 points shall be used for second order, 7 points shall be used for third order)	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed. For PCB analysis, a mixture of Aroclors 1016 and 1260 is normally used to establish detector calibration linearity, unless project-specific data suggest the presence of another Aroclor (e.g., 1232). In addition, a mid-level or lower standard for each of the remaining Aroclors is analyzed for pattern recognition and response factor.	p. 484 Inst SGC_U 7/16/14 OK
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 20% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	p. 522 ICV 280-234596/11 7/16/14 Inst SGC_U
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL and at the beginning of the analytical shift	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift.	NA	NA		p. 483 ICAL

Method Validated: 8015B (TPH-DRO) Initial Review by: D. Knaub Date: 10/21/14 SDG#:280-59565-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time Window Verification for Each Analyte and Surrogate	Each calibration verification standard	Analyte within established window	Correct problem, then reanalyze all samples analyzed since the last acceptable retention time check. If they fail, redo ICAL and reset retention time window,	Flagging criteria are not appropriate for initial verification. For CCV, apply a Q-flag to all results for analytes outside the established window.	No samples shall be run without a verified retention time window at the initial verification. For method 8015, check state methods for use of modified retention time markers with gasoline range organics (GRO) or diesel range organics (DRO).	p. 523 ICV p. 530 CCV p. 537 CCV
Calibration Verification (Initial [ICV] and Continuing [CCV])	ICV: Daily, before sample analysis CCV: After every 10 field samples and at the end of the analysis sequence	All analytes within ± 20% of expected value from the ICAL	ICV: Correct problem, rerun ICV. If that fails, repeat initial calibration. See section 5.5.10 and box 55. CCV: Correct problem then repeat CCV and reanalyze all samples since last successful calibration verification.	ICV: Flagging criteria are not appropriate. CCV: Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification, if . reanalysis is not possible.	If %D for an individual analyte is > 20%, no samples may be analyzed until the problem has been corrected.	p. 529 CCVRT 280-242565/4 9/09/14 Inst SGC_U p. 536 CCV 280-242565/12 9/09/14 Inst SGC_U
Method Blank	One per preparatory batch	No analytes detected > ½RL. For common laboratory contaminants, no analytes detected > RL.	Correct problem, then see criteria in box 0-5; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch		p. 46 MB 280-241972/1-A DRO=ND

Method Validated: 8015B (TPH-DRO) Initial Review by: D. Knaub Date: 10/21/14 SDG#:280-59565-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Laboratory Control Sample (LCS) Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	QC acceptance criteria specified by DoD, if available; see box D-7 and Appendix DoD-D .	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix DoD D)	If corrective action fails apply J-flag to specific analyte(s) in all samples in the associated preparatory batch		p. 46 LCS/LCSD 280-241972/ 2-A,3-A DRO = 70, 84 RPD = 17
Matrix Spike (MS)	One MS per preparatory batch per matrix (see box ID- 11)	For matrix evaluation, use QC acceptance criteria specified by DoD for LCS.	Examine the project-specific DQOs. Contact the client as to additional measures to be taken,	Lab: For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	No MS/MSD submitted with this SDG
Matrix Spike Duplicate (MSD) or Sample Duplicate	One per preparatory batch per matrix	RPD ≤30% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	Lab: For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	No MSD or lab dup performed with this SDG
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤30%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		ST012-W11-WG-090214/ ST012-DUP01-WG-090214 RPD = 1.8%

Method Validated: 8015B (TPH-DRO) Initial Review by: D. Knaub Date: 10/21/14 SDG#:280-59565-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Surrogate Spike (Analytes Identified in Appendix DoD-D)	All field and QC samples	QC acceptance criteria for LCS specified by DoD, if available; otherwise method- specified criteria or laboratory's own in-house criteria	For QC and field samples, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	For the specific analyte(s) in all field samples collected from the same site matrix as the parent, apply J-flag if acceptance criteria are not met. For QC samples, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	Alternative surrogates are recommended when there is obvious chromatographic interference.	p. 41 **All ok**
Confirmation of Positive Results (Second Column or Second Detector)	All positive results must be confirmed (in Method 8081A exclude toxaphene and technical chlordane, in Method 8015B exclude GRO, DRO, and residual range organics (RRO)).	Calibration and QC criteria same as for initial or primary column analysis. Results between primary and second column RPD ≤ 40%.	NA	Apply J-flag if RFD > 40% or Q-flag if sample is not confirmed. Discuss in the case narrative.	Report the higher of two confirmed results unless overlapping peaks are causing erroneously high results, then report the non- affected result and document in the case narrative.	NA
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between LOD and LOQ. Validator flags: If using AFCEE; Apply "F" flag		No targets detected between LOD and LOQ

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
QC Blanks (Trip Blanks, Equipment Blanks, and Field Blanks)	Trip Blank – one per cooler containing samples for volatile parameters Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B"		ST012-EB01-090214 not analyzed for DRO

Method Validated: 9056A

Initial Review by: D. Knaub Date: 10/21/14

Senior Review by: J. Hartness Date: 10/27/14

SDG#: 280-59565-1

Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	ok
Limit of Detection Determination and Verification (LOD) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOD verification checks shall be performed (see box D-13)	See 40 CFR 1368. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL / LOD verification check at higher level and set MDL higher or reconduct MDL study (see box D-13).	NA	Samples cannot be analyzed without a valid MDL.	p. 1233 6/16/2013
Limit of Quantitation Establishment and Verification (LOQ) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOQ verification checks shall be performed (see box D-14)	Within calibration range including low standard; within method precision and accuracy.	Re-run LOQ	NA	Samples cannot be analyzed without a valid LOQ	MRL check: Level 4 Package Pg. 1232, 1323 (9/03/14) = All OK

Method Validated: 9056A

Initial Review by: D. Knaub Date: 10/21/14

Senior Review by: J. Hartness Date: 10/27/14

SDG#: 280-59565-1

Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time (RT) Window Width Calculated for Each Analyte and Surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 24-hour study.	NA	NA		OK
Container, Preservation, and Holding Time	All field samples	500 ml poly, Cool to 4°C Nitrate – 48 hours Nitrite, sulfate, chloride – 28 days	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collected: 9/02/14 Temp: 6.7°C Analyzed: 9/03/14
ICAL for All Analytes (Minimum Three Standards and One Calibration Blank)	Initial calibration prior to sample analysis	R ≥ 0.995	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.	p. 1237 Level IV package 8/27/14 6 levels Inst. 11 OK
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 10% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	p. 1228, 1237 Level 4 Package OK
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL and at the beginning of the analytical shift	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift.	NA	NA		OK

Method Validated: 9056A

Initial Review by: D. Knaub Date: 10/21/14

Senior Review by: J. Hartness Date: 10/27/14

SDG#: 280-59565-1

Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Midrange Continuing Calibration Verification (CCV)	After every 10 field samples and at end of the analysis sequence.	All analytes within established retention time windows and within ± 10% of true value	Correct problem then repeat CCV. If that fails, then repeat ICAL. Reanalyze all samples since last successful calibration verification.	Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification, if . reanalysis is not possible.	No samples may be analyzed until the problem has been corrected.	p. 1227, 1228 Level IV Package 9/03/14 All OK
Method Blank	One per preparatory batch	No analytes detected > ½ RL. See box D-1.	Correct problem, then see criteria in box D-1; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	Lab: Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch. Validator; Apply "B" flag if result is less than 5x method blank.		p. 54 MB 280-24164/6 ortho-P = ND p. MB 280-241650/6 Br, Cl, SO4 = ND p. 1227: CCBs ortho-P All ND p. 1228: CCBs Cl 21:12 0.63 mg/L – ***no flag; samples >5x blank amount***
Laboratory Control Sample (LCS) Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	Use laboratory in-house LCS acceptance criteria (not to exceed 20%).See Box D-3.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix G)	If corrective action fails apply J-flag to specific analyte(s) in all samples in the associated preparatory batch		p. 54 ortho-P = 95, 95 OK p. 57 Br = 98, 98 Cl = 98, 98 SO4 = 95, 94 All OK

Method Validated: 9056A

Initial Review by: D. Knaub Date: 10/21/14

Senior Review by: J. Hartness Date: 10/27/14

SDG#: 280-59565-1

Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Matrix Spike (MS)	One MS per preparatory batch per matrix (see box D- 7)	For matrix evaluation, use laboratory in-house LCS acceptance criteria (not to exceed 20%).	Examine the project-specific 000s. Contact the client as to additional measures to be taken,	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	No MS/MSDs from this SDG.
Matrix Spike Duplicate (MSD) or Sample Duplicate	One per preparatory batch per matrix	RPD ≤15% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	NA
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤10%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		ST012-W11-WG-090214/ ST012-DUP01-WG-090214 See RPDs below
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between LOD and LOQ. Validator flags: If using AFCEE; Apply "F" flag		No detections between LOD and LOQ
QC Blanks (Equipment Blanks and Field Blanks)	Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B".		ST012-EB01-090214 not analyzed for anions

Method Validated: 9056A

Initial Review by: D. Knaub Date: 10/21/14

Senior Review by: J. Hartness Date: 10/27/14

SDG#: 280-59565-1

Matrix: Groundwater

Field Duplicates:

	ST012-W11-WG-090214	ST012-DUP01-WG-090214	RPD	
Br	2.6	1.5	53.7	Flag both results "J"
Cl	780	780	0.0	
SO4	6.4	6.6	3.1	

Method Validated: 6010

Initial Review by: D. Knaub Date: 10/21/14 SDG#:280-59565-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETRY (METHOD 6010)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	Ok
Instrument Detection Limit (IDL) Study	At initial set-up and after significant change in instrument type, personnel, test method, or sample matrix	IDL shall be ≤ Limit of Detection (LOD)	NA	NA		p. 589 6/11/13
Container, Preservation, and Holding Time	All field samples	Water: 500 ml Poly, HNO_3 to pH < 2, Cool to 6°C, Soil: 4 oz glass or poly jar, Cool to 6°C 180 days to analysis	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collection date: 9/02/14 Prep; 9/05/14 Analysis date: 9/05/14, 9/08/14 (Mg and K) Temp:6.7 °C

Method Validated: 6010 | Initial Review by: D. Knaub | Date: 10/21/14 | SDG#:280-59565-1
Senior Review by: J. Hartness | Date: 10/27/14 | Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETRY (METHOD 6010)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Initial calibration (ICAL) for all analytes (minimum one high standard and a calibration blank)	Daily ICAL prior to sample analysis	If more than one calibration standard is used, r ≥ 0.995.	Correct problem then repeat ICAL.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.	p. 599 run log (Ca, Fe, Mg, Na) ICIS analyzed 9/05/2014 13:36 IC analyzed 9/05/2014 13:39 and 13:41 p. 601 run log (K, Mn) ICIS analyzed 9/08/14 10:58 IC analyzed 9/0814 11:00 and 11:03
Second Source Calibration Verification (ICV)	Once after each ICAL, prior to beginning sample run	Value of second source for all analytes within ± 10% of true value	Correct problem and verify second source standard. Rerun ICV. If that fails, correct problem and repeat ICAL.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	p. 568 ICVH 280-242265/6 9/05/2014 All OK p. 569 ICV 280-242265/7 9/05/2014 All OK p. 570 ICVL 280-242265/8 9/05/2014 All OK p. 571 ICVH 280-242487/6 9/08/14 p. 572 ICV 280-242487/7 9/08/14 p. 573 ICVL 280-242487/8 9/08/14

Method Validated: 6010 | Initial Review by: D. Knaub | Date: 10/21/14 | SDG#:280-59565-1
Senior Review by: J. Hartness | Date: 10/27/14 | Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETRY (METHOD 6010)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Continuing Calibration Verification (CCV)	After every 10 field samples and at the end of the analysis sequence	All analytes within ± 10% of true value	Correct problem, rerun CCV. If that fails, then repeat ICAL. Reanalyze all samples since last successful calibration verification	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q-flag to all results for the specific analyte(s) of interest in all samples since the last acceptable CCV. Validator flags: If using AFCEE; Apply "J" flag only if reanalysis cannot be performed	Problem must be corrected. Results may not be reported without a valid CCV. Flagging is only appropriate in cases where the samples cannot be reanalyzed.	p. 568 CCVH 280-242265/24,36 9/05/14 All OK p. 569 CCV 280-242265/25, 37 9/05/14 All OK p. 570 CCVL 280-242265/27, 39 9/05/14 All OK Fe=117% ***No flag: samples high level*** p. 571 CCVH 280-242487/68, 80 9/08/2014 All OK p. 572 CCV 280-242487/69, 81 9/08/14 All OK p. 573 CCVL 280-242487/71, 83 9/08/14 All OK
Low-level calibration check standard	Daily, after one-point ICAL	Within ± 20% of true value	Correct problem, then reanalyze	Flagging criteria are not appropriate.	No samples may be analyzed without a valid low-level calibration check standard. Low-level calibration check standard should be less than or equal to the reporting limit.	p. 574 ***All OK***
Linear dynamic range or high-level check standard	Every 6 months -	Within ±10% of expected value	NA	NA		p. 597 7/21/14

Method Validated: 6010 | Initial Review by: D. Knaub | Date: 10/21/14 | SDG#:280-59565-1
Senior Review by: J. Hartness | Date: 10/27/14 | Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETRY (METHOD 6010)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Method Blank	One per preparatory batch	No analytes detected > ½ RL and greater than 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL (see Box D-1).	Correct problem, then see criteria in box D-1; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch	Problem must be corrected. Results may not be reported without a valid method blank. Flagging is only appropriate in cases where samples cannot be reanalyzed.	p. 48 MB-280-241934/1-A All ND
Calibration blank	Before beginning a sample run, after every 10 samples, and at end of the analysis sequence	No analytes detected > LOD	Correct problem. Reprep and reanalyze calibration blank. All samples following the last acceptable calibration blank must be reanalyzed	Apply B-flag to all results for specific analyte(s) in all samples associated with the blank.		p. 575 9/05/14 ICB/CCBs 280-252265/12,26,38 All ND p. 576 9/08/14 ICB/CCBs 280-242487/11, 70, 82 Mn = 0.250 J x 5 = 1.25 ug/L Mn = 0.280 J x 5 = 1.4 ug/L *Mn detected in samples at 5x greater than CCB: No qualification required*
Interference check solutions (ICS-A and ICS-AB)	At the beginning of an analytical run and every 12 hours	ICS-A: Absolute value of concentration for all non-spiked analytes < LOD (unless they are a verified trace impurity from one of the spiked analytes) ICS-AB: Within ±20% of expected value	Terminate analysis, locate and correct problem, reanalyze ICS, reanalyze all samples.	If corrective action fails, apply Q-flag to all results for specific analyte(s) in all samples associated with the ICS. Validator flags: If using AFCEE; Apply "M" flag		p. 579 9/05/14 ICSA - All OK p. 580 9/05/14 ICS-AB All OK p. 581 9/08/14 ICS-A Mn >LOD *No qualification- vendor verified trace impurities* p. 582 9/08/14 ICS-AB All OK

Method Validated: 6010 | Initial Review by: D. Knaub | Date: 10/21/14 | SDG#:280-59565-1
Senior Review by: J. Hartness | Date: 10/27/14 | Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETRY (METHOD 6010)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Laboratory Control Sample (LCS) Containing All Analytes to be Reported	One per preparatory batch	QC acceptance criteria specified by DoD, if available; see box D-3 and Appendix G.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix G)	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch Validator flags: If using AFCEE; Apply "J" flag	Problem must be corrected. Results may not be reported without a valid LCS. Flagging is only appropriate in cases where the samples cannot be reanalyzed.	p. 49 LCS-280-241934/2-A 9/05/14 All OK
Matrix Spike (MS)	One per preparatory batch per matrix (see box D-7)	For matrix evaluation, use QC acceptance criteria specified by DoD for LCS.	Examine the project-specific DQOs. If the matrix spike falls outside of DoD criteria, additional quality control test (dilution test and post-digestion spike addition) are required to evaluate matrix effects.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	p. 51 ST012-W11-WG-090214 All ok
Matrix Spike Duplicate (MSD)	One per preparatory batch per matrix (see Box D-7)	MSD: For matrix evaluation use QC acceptance criteria specified by DoD for LCS MSD RPD < 20%	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	p. 51 ST012-W11-WG-0714 RPDs All ok
Dilution test	Once per preparatory batch	Five-fold dilution must agree within ± 10% of the original measurement	Perform post-digestion spike addition.	Flagging criteria are not appropriate.	Only applicable for samples with concentrations > 50 x LOQ.	p. 53 ST012-W11-WG-090214 All OK
Post digestion spike addition	When dilution test fails or analyte concentration for all samples < 50 x LOQ	Recovery within 75-125% of (see Table B-1)	Run all associated samples in the preparatory batch by method of standard additions (MSA) or see flagging criteria.	For specific analyte(s) in the parent sample, apply J-flag of acceptance criteria are not met.	Spike addition should produce a concentration of 10 - 100 x LOQ	p. 50 Ca = 61% Mn = -25% ***No qualification: sample results greater than 4x spike amount***

Method Validated: 6010

Initial Review by: D. Knaub Date: 10/21/14 SDG#:280-59565-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETRY (METHOD 6010)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Method of standard additions (MSA)	When matrix interference is suspected	NA	NA	NA	Document use of MSA in the case narrative.	NA
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD 20%	Qualify samples	For the specific analyte(s) in the parent & dup samples, apply J-flag if acceptance criteria are not met.		ST012-W11-WG-090214/ ST012-DUP01-WG-090214 See RPDs below – all ok
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between DL and LOQ. Validator flags: If using AFCEE; Apply "F" flag		Results reported between MDL and RL flagged "F" for AFCEE.
QC Blanks (Equipment Blanks, and Field Blanks)	Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value are qualified as estimated and flagged "B".		ST012-EB01-090214 not analyzed for metals

Field Duplicates:

	ST012-W11-WG-090214/	ST012-DUP01-WG-090214	RPD
Ca	300000	310000	3.3
Fe	140	150	6.9
Mg	67000	68000	1.5
Na	76000	78000	2.6
Mg	2000	2100	4.9
K	16000	16000	0.0

Data Evaluation Narrative
AMEC Project: Former Williams AFB
AMEC Project Number: 9101110001.5300.5301
Site: ST012 – Enhanced Bioremediation Field Test
Sampling Event: September 2014
Matrix: Groundwater

SDG: 280-59588-1

1.0 INTRODUCTION

A data quality evaluation (DQE) was performed on the data reported for the Enhanced Bioremediation field test conducted at Site ST012 in September 2014, at the former Williams Air Force Base (AFB), Mesa, Arizona. The following sections provide summary discussions of the required data qualifications for each site and analytical methods for samples collected at the former WAFB. Data validation was conducted on 100% of the primary samples and field quality control samples (trip blanks, rinsate blanks, sample duplicates, and matrix spike/matrix spike duplicate [MS/MSD] samples). A Level III (Step IIB) data validation was performed using supplemental checklists to review the following quality control elements: laboratory case narrative, sample documentation, chain-of-custody, holding time protocols, method-specific calibration information, mass tunes, method blank results, laboratory control sample (LCS) results, surrogate recoveries (where applicable), MS/MSD recoveries and relative percent differences (RPDs), field duplicate RPDs, trip and equipment/rinsate blanks, method-specific QC elements (such as interelement check standards (ICS), serial dilutions, post digestion spikes (PDS), column breakdown, etc.), method sensitivity, and completeness. The Level III DQE checklists are attached to this narrative.

Data were reviewed using precision and accuracy control limits presented in The Department of Defense (DoD) Quality Systems Manual (QSM) Version 4.2 (DoD, 2010). DQE data qualifications were applied if necessary in accordance with procedures in Air Force Center for Environmental Excellence (AFCEE) Quality Assurance Project Plan (QAPP), Version 4.0.01 (AFCEE, 2005), the method, and professional judgment using the following qualifiers:

J = The reported concentration is considered an estimated value due to discrepancies in meeting certain analyte-specific quality control criteria.
F = The reported concentration is between the limit of quantitation/reporting limit (LOQ/RL) and method detection limit (MDL) and is considered an estimated value
UJ = The target compound was not detected and the reporting limit is considered imprecise due to discrepancies in meeting certain analyte-specific quality control criteria.
B = The result may be biased high or a false positive based on blank data.
M = The reported concentration is estimated due to matrix effects.
R = The data are considered unusable due to discrepancies in meeting certain quality control criteria and may not be used in decision making.

2.0 DELIVERABLES

The data packages as submitted to AMEC Environment and Infrastructure, Inc. (AMEC) are complete as stipulated in the Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) for Site ST012 Enhanced Bioremediation Field Test Plan (AMEC, 2014), and the applicable guidelines described in the former Williams AFB Performance Based Remediation Program QAPP and standard operating procedures (SOPs) (collectively referred to as the QAPP/SOP [AMEC, 2012]) for U.S. States Environmental Protection Agency (EPA) Methods SW8260B, SW8015B, SW9056A, and SW6010C.

3.0 SAMPLE INTEGRITY

Samples within this sample delivery group (SDG) collected from ST012 were submitted to TestAmerica Laboratories (TAL) in Denver, Colorado for select volatile organic compounds (VOCs) analysis by USEPA Method SW8260B, total petroleum hydrocarbons-gasoline range organics (TPH-GRO) and diesel range organics (TPH-DRO) by Method SW8015B, anions by Method SW9056A and select metals by Method SW6010C.

Based on the information provided on the cooler receipt forms, samples arrived at the laboratory within the recommended temperature and preservation requirements. Completed Chain-of-Custody (COC) documents are included in the data package.

4.0 SAMPLE IDENTIFICATION

This SDG contains the following water and quality control (QC) samples:

Site: ST012	QC Samples
ST012-W30-WG-090214	TB01-090314

These samples were collected on 2 and 3 September 2014.

5.0 SAMPLE QUALIFICATION

Only those components that required qualification of the data are presented in this narrative. All Level III components were within the DoD QSM QC limits, with the following exceptions:

- Constituents were present in the associated blanks and flagged “B”.
- Surrogate recoveries were outside QC limits and results flagged “J”.
- Metals were detected in the Interference Check Solution A (ICSA) (no qualification required).
- PDS recoveries were outside QC limits for two metals (no flags applied).
- MS/MSD recoveries were outside of QC limits and results flagged “M”.

6.0 VOCS (SW8260B)

Samples collected from site ST012 were submitted for VOCs by EPA Method SW8260B and analyzed for site-specific VOC compounds of interest (COIs).

A Level III validation was performed on this method and only those components that exceeded the QAPP/SOP criteria are presented below. Each of the Level III components was within the QAPP/SOP QC criteria; however the following qualification was noted:

- Constituents were present in the associated blanks and flagged "B".

6.1 Method Blank

The method blank for this SDG contained methylene chloride (1.01 J micrograms per liter [µg/L]). Any associated sample with results less than 5x (10x for common contaminants) the method blank results were considered as possibly biased high or false positive and flagged "B". The 5x/10x rule was applied to the raw response in the sample prior to dilution and sample volume calculations.

Action: The methylene chloride results in each of the samples in this SDG were qualified as estimated with a possible high bias and flagged "B".

6.2 Trip Blank

The trip blank sample in this SDG contained methylene chloride at 0.36 J µg/L. Any associated sample with results less than 5x (10x for common contaminants) the blank results were considered as possibly biased high or false positive and flagged "B".

Action: The methylene chloride result for the trip blank sample was qualified as possibly biased high due to method blank contamination: therefore, no additional qualification was necessary.

6.3 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of VOCs by USEPA Method SW 8260B except where dilutions were required to place the constituent within the calibration range. Dilutions were required. The laboratory indicated a dilution with a "D" qualifier which was subsequently removed during the validation process.

Any result reported between the LOQ and MDL is considered a quantitative estimate. No results in this SDG were reported between the RL and MDL.

7.0 TPH-GRO (8015B)

Samples collected from Site ST012 were submitted for TPH-GRO analysis by EPA Method SW8015B. A Level III validation was performed on this method and only those components that

exceeded the program document QAPP/SOP criteria are presented below. Qualification was required for the following:

- Surrogate recoveries were outside QC limits and associated results flagged "J".

7.1 Surrogate Recoveries

Surrogate a,a,a-trifluorotoluene recovered above the QC limits in sample ST012-W30-WG-090214. No qualification is required if the samples were diluted or the surrogate recoveries were high and the sample results were non-detect.

Action: The GRO result for sample ST012-W30-WG-090214 was qualified as estimated and flagged "J".

7.2 Limits of Quantitation

The LOQ as specified in the QAPP/SOP (AMEC, 2012) was met for samples submitted for the analysis of TPH-GRO by EPA Method SW8015B except where dilutions were required to place the constituent within the calibration range. Due to high levels of TPH-GRO, one sample reported with this SDG (ST012-W30-WG-090214) was prepared using a reduced aliquot size to bring the results into the linear calibration range, resulting in an elevated RL.

8.0 TPH-DRO (8015B)

Samples collected from Site ST012 were submitted for TPH-DRO analysis by EPA Method SW8015B. A Level III validation was performed on this method and each of the components met the program document QAPP/SOP criteria. It should be noted that the laboratory placed an "M" qualifier on any result that was manually integrated. The "M" qualifier was subsequently removed during the data validation process.

8.1 Limits of Quantitation

The LOQ as specified in the QAPP/SOP (AMEC, 2012) was met for samples submitted for the analysis of TPH-DRO by EPA Method SW8015B. Dilutions were not required for TPH-DRO.

9.0 ANIONS (SW9056A)

Samples collected from site ST012 were submitted for Anions by Method SW9056A. A Level III validation was performed on this method and only those components that exceeded the QAPP/SOP criteria are presented below. Qualification was required for the following:

- MS/MSD recoveries were outside QC limits and results were flagged "M".

9.1 Matrix Spike/Matrix Spike Duplicate

An MS/MSD was performed on sample ST012-W30-WG-090214 for anions, and the recoveries were outside of QC limits for bromide and chloride.

Action: No qualification was necessary for chloride because the sample was analyzed at a dilution. The bromide result for sample ST012-W30-WG-090214 was qualified as estimated and flagged "M".

9.2 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of Anions by USEPA Method SW 9056A with the exception of analytes that required dilution. The sample in this SDG required dilution for chloride resulting in elevated LOQs. The laboratory indicated a dilution with a "D" qualifier which was subsequently removed during the validation process.

10.0 METALS (SW6010C)

Samples collected from Site ST012 were submitted for the major metal cations by EPA Method SW6010C. Samples were analyzed for calcium, iron, magnesium, manganese, potassium, and sodium. A Level III validation was performed on this method and only those components that required qualification of the data are presented in this narrative. All Level III validation was performed on this method and only those components that exceeded the SAP/TAL SOP criteria are presented below. The following components exceeded the QC criteria or were noted:

- Constituents were present in the associated blanks and flagged "B" (no flags applied).
- Metals were detected in the Interference Check Solution A (ICSA) (no qualification required).
- PDS recoveries were outside QC limits for two metals (no flags applied).
- Results were present between the MDL and LOQ and flagged "F".

10.1 Method Blanks

The method blank showed the presence of low levels of calcium (375 J µg/L). Associated sample results less than 5x the blank value were qualified as estimated and flagged "B".

Action: No qualification was required because the associated calcium result in the sample was greater than 5 x the blank value.

10.2 Continuing Calibration Blanks

Two CCBs showed the presence of low levels of magnesium (0.270 J µg/L and 0.330 µg/L). Associated sample results less than 5x the blank value were qualified as estimated and flagged "B".

Action: No qualification was required because the associated manganese results in the samples were greater than 5 x the blank value.

10.3 Interference Check Solution A (ICSA)

Manganese was detected in the ICSA solution associated with prep batch 280-242295. The vendor verified that the ICSA contained these trace impurities.

Action: No qualification is required for impurities verified by the vendor.

10.4 Post Digestion Spike

The laboratory performed a PDS on sample ST012-W30-WG-090214 and the recoveries for calcium and manganese were outside of the QC limits. No qualification is required if the recoveries were high and the samples were non-detect or the analyte was present in the sample at concentrations greater than 4x the spike amount.

Action: No qualification was required for calcium and manganese results in sample ST012-W30-WG-090214 because the metals were present in the sample at greater than 4x the spike amount.

10.5 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of metals by USEPA Method SW6010C except where dilutions were required to place the constituent concentration within the calibration range. No Dilutions were required.

11.0 OVERALL SITE EVALUATION AND PROFESSIONAL JUDGMENT

Edits to the DQE qualifiers by professional judgment were not required.

12.0 SUMMARY OF DATA QUALITY INDICATORS

This section provides an assessment of the data based on project data quality indicators (DQIs) described on QAPP Worksheet #37 of the Program Document QAPP/SOP (AMEC, 2012). The DQIs consist of precision, accuracy, representativeness, comparability, completeness, and sensitivity.

12.1 Precision

An assessment of precision of analytical data is accomplished via review of field duplicate and MS/MSD analyses. Field duplicate and MS/MSD analyses are used to assess field variability, which includes sample collection/handling as well as matrix homogeneity. Precision is expressed as the relative percent difference (RPD) between results for duplicate pairs.

No field duplicate samples or project specific MS/MSDs were submitted; however, a MS/MSD was performed on a project sample for metals and anions and the RPDs were within QC limits. Precision for TPH-GRO and TPH-DRO was evaluated through the analysis of the LCS/LCSD and the RPDs were compliant with the QAPP/SOP. The overall method and sample matrix precision are acceptable and achieve project objectives.

12.2 Accuracy (Bias)

An assessment of accuracy of analytical data is accomplished via evaluation of the spike recoveries in the MS/MSD, LCS, post digestion spike samples, and surrogate spike compounds, in addition to calibration criteria. Accuracy is expressed as percent recovery. Accuracy data were compliant with the QAPP/SOP with the exception of TPH-GRO surrogates and MS/MSD recoveries for anions. The DQE resulted in the qualification of the TPH-GRO and bromide result as estimated in one sample. Estimated data is usable data and all remaining accuracy data for the other anions, VOCs, TPH-DRO, and metals were within QC limits or did not require qualification. Therefore, the data results indicate method and matrix accuracy is acceptable to achieve project objectives.

12.3 Representativeness

Representativeness for the analytical data is determined through evaluation of the associated blank data and evaluation of appropriate sample handling procedures. All samples were properly stored and preserved in the field and at TestAmerica. Method, trip, and equipment blanks were acceptable with the exception of methylene chloride. Blank contamination resulted in qualification of the associated sample data. Based on historical results and the low-level concentrations qualified, the impacts to project DQOs were minimal; therefore, the analytical results indicate sample data are representative of the Site conditions.

12.4 Comparability

Comparability addresses the confidence with which one data set can be compared to another. Use of appropriate sampling methods, COC procedures, and EPA-approved analytical methods, as well as adherence to strict QA/QC procedures, provide the basis for uniformity in sample collection and analysis. Analytical data were generated by TestAmerica using standard reporting units of micrograms per liter for VOCs, TPH-GRO, and metals and milligrams per liter for TPH-DRO and anions. In addition, sample collection and analytical method protocols were implemented in accordance with approved, documented procedures. Analytical data are determined to be comparable to previous Site results.

12.5 Completeness

Completeness of the field sampling activities were assessed in terms of the actual number and type of sample results received from the field and laboratory, as compared with the planned number and type of sample results. All samples planned were collected which meets a field completeness of 100%.

Analytical completeness of data is a measure of the number of valid project-specific data results obtained in comparison to the total number of data results projected to achieve project DQOs. Valid data are defined as data that meet the project-specific DQOs. No data were rejected as a result of the data validation; however, some of the results were qualified as estimated. Estimated data is usable data. The completeness goals met the 90 percent goal for field and laboratory data expected for this project.

12.6 Sensitivity

Analytical methods and RLs were implemented in accordance with the QAPP/SOP and EPA promulgated methodologies. Method RLs were achieved for the event except when sample dilutions were required to bring target compounds within the linear range of the instrument calibration. As previously mentioned, the samples within this SDG required dilutions for VOCs and chloride to place the results within the calibration range. These include modified RLs for selected detections; therefore, sensitivity requirements were met for non-diluted constituents.

12.7 Usability Summary

The data generated during the September 2014 sampling event were usable with qualifications with respect to project DQOs. The DQOs for the Enhanced Bioremediation Field Test is to produce data to support design of anaerobic methods for the ST012 remedy if selected.

13.0 REFERENCES

AFCEE, 2005. Quality Assurance Project Plan, Version 4.0.01, May, 2005.

AMEC, August 11, 2014. *Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) (Enhanced Bioremediation Field Test Plan) Operable Unit 2 Site ST012 - Liquid Fuels Storage Area, Former Williams Air Force Base, Mesa, Arizona*.

AMEC, February 23, 2012. *Performance Based Remediation Program Quality Assurance Project Plan (QAPP) and Standard Operating Procedures (SOPs) (QAP/SOP), Former Williams Air Force Base, Mesa, Arizona*.

DoD, 2010. Department of Defense Quality System Manual, Version 4.2 Final, October 2010.

Prepared/Date: DWK 10/23/14
Checked/Date: JAH 10/27/14

Flagged Data Reports

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-59588-1

Client Sample ID: **ST012-W30-WG-090214**

Lab Sample ID: 280-59588-1 Date Sampled: 09/02/2014 1037
Client Matrix: Water Date Received: 09/04/2014 1000

8260B Volatile Organic Compounds (GC/MS)

Analysis Method:	8260B	Analysis Batch:	280-242744	Instrument ID:	VMS_G2
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	G2_5016.D
Dilution:	10			Initial Weight/Volume:	20 mL
Analysis Date:	09/11/2014 0223			Final Weight/Volume:	20 mL
Prep Date:	09/11/2014 0223				

Analyte	Result (ug/L)	Qualifier	DL	LOQ
1,2-Dichloroethane	4.0	U	1.3	10
Methylene Chloride	12	J D B	3.2	50
m-Xylene & p-Xylene	570	D	3.4	20
Naphthalene	110	D	2.2	10
o-Xylene	130	D	1.9	10
Toluene	160	D	1.7	10
Trichloroethene (TCE)	2.0	U	1.6	10
Trichlorofluoromethane	8.0	U	2.9	20
Xylenes, Total	700	D	1.9	20

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	102		70 - 120
4-Bromofluorobenzene (Surr)	106		75 - 120
Dibromofluoromethane (Surr)	101		85 - 115
Toluene-d8 (Surr)	105		85 - 120

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-59588-1

Client Sample ID: **ST012-W30-WG-090214**

Lab Sample ID: 280-59588-1 Date Sampled: 09/02/2014 1037
Client Matrix: Water Date Received: 09/04/2014 1000

8260B Volatile Organic Compounds (GC/MS)

Analysis Method:	8260B	Analysis Batch:	280-242801	Instrument ID:	VMS_Z
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	Z0494.D
Dilution:	100			Initial Weight/Volume:	20 mL
Analysis Date:	09/11/2014 1523	Run Type:	DL	Final Weight/Volume:	20 mL
Prep Date:	09/11/2014 1523				

DWS 10/03/14

Analyte	Result (ug/L)	Qualifier	DL	LOQ
Benzene	2700	D	16	100
Ethylbenzene	920	D	16	100

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	88		70 - 120
4-Bromofluorobenzene (Surr)	116		75 - 120
Dibromofluoromethane (Surr)	108		85 - 115
Toluene-d8 (Surr)	107		85 - 120

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-59588-1

Client Sample ID: TB01-090314

Lab Sample ID: 280-59588-2TB
Client Matrix: Water

Date Sampled: 09/02/2014 0000
Date Received: 09/04/2014 1000

8260B Volatile Organic Compounds (GC/MS)

Analysis Method:	8260B	Analysis Batch:	280-242744	Instrument ID:	VMS_G2
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	G2_5018.D
Dilution:	1.0			Initial Weight/Volume:	20 mL
Analysis Date:	09/11/2014 0304			Final Weight/Volume:	20 mL
Prep Date:	09/11/2014 0304				

dwk
10/2 3/17

Analyte	Result (ug/L)	Qualifier	DL	LOQ
1,2-Dichloroethane	0.40	U	0.13	1.0
Benzene	0.20	U	0.16	1.0
Ethylbenzene	0.20	U	0.16	1.0
Methylene Chloride	0.36	J B	0.32	5.0
m-Xylene & p-Xylene	0.80	U	0.34	2.0
Naphthalene	0.80	U	0.22	1.0
o-Xylene	0.40	U	0.19	1.0
Toluene	0.40	U	0.17	1.0
Trichloroethene (TCE)	0.20	U	0.16	1.0
Trichlorofluoromethane	0.80	U	0.29	2.0
Xylenes, Total	1.6	U	0.19	2.0

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	90		70 - 120
4-Bromofluorobenzene (Surr)	95		75 - 120
Dibromofluoromethane (Surr)	93		85 - 115
Toluene-d8 (Surr)	90		85 - 120

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-59588-1

Client Sample ID: **ST012-W30-WG-090214**

Lab Sample ID: 280-59588-1 Date Sampled: 09/02/2014 1037
Client Matrix: Water Date Received: 09/04/2014 1000

8015B_GRO Gasoline Range Organics (GRO)

Analysis Method:	8015B_GRO	Analysis Batch:	280-243077	Instrument ID:	VGC_Q
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	001F0701.D
Dilution:	1.0			Initial Weight/Volume:	0.25 mL
Analysis Date:	09/12/2014 1258			Final Weight/Volume:	5 mL
Prep Date:	09/12/2014 1258			Injection Volume:	5 mL

Analyte	Result (ug/L)	Qualifier	DL	LOQ
Gasoline Range Organics (GRO)-C6-C10	13000	J	200	500

Surrogate	%Rec	Qualifier	Acceptance Limits
a,a,a-Trifluorotoluene	154	*	82 - 110

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-59588-1

Client Sample ID: **TB01-090314**

Lab Sample ID: 280-59588-2TB
Client Matrix: Water

Date Sampled: 09/02/2014 0000
Date Received: 09/04/2014 1000

8015B_GRO Gasoline Range Organics (GRO)

Analysis Method:	8015B_GRO	Analysis Batch:	280-242714	Instrument ID:	VGC_Q
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	020F2001.D
Dilution:	1.0			Initial Weight/Volume:	5 mL
Analysis Date:	09/09/2014 2228			Final Weight/Volume:	5 mL
Prep Date:	09/09/2014 2228			Injection Volume:	5 mL

Analyte	Result (ug/L)	Qualifier	DL	LOQ
Gasoline Range Organics (GRO)-C6-C10	20	U	10	25

Surrogate	%Rec	Qualifier	Acceptance Limits
a,a,a-Trifluorotoluene	87		82 - 110

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-59588-1

Client Sample ID: **ST012-W30-WG-090214**

Lab Sample ID: 280-59588-1 Date Sampled: 09/02/2014 1037
Client Matrix: Water Date Received: 09/04/2014 1000

8015B_DRO Diesel Range Organics (DRO) (GC)

Analysis Method:	8015B_DRO	Analysis Batch:	280-242565	Instrument ID:	SGC_U
Prep Method:	3510C	Prep Batch:	280-241972	Initial Weight/Volume:	1050.3 mL
Dilution:	1.0			Final Weight/Volume:	1 mL
Analysis Date:	09/09/2014 2052			Injection Volume:	1 uL
Prep Date:	09/04/2014 1712			Result Type:	PRIMARY

DWK 10/23/14

Analyte	Result (mg/L)	Qualifier	DL	LOQ
Diesel Range Organics [C10-C28]	1.2	M	0.031	0.24

Surrogate	%Rec	Qualifier	Acceptance Limits
o-Terphenyl	73	M	50 - 115

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-59588-1

Client Sample ID: ST012-W30-WG-090214

Lab Sample ID: 280-59588-1 Date Sampled: 09/02/2014 1037
Client Matrix: Water Date Received: 09/04/2014 1000

6010C Metals (ICP)

Analysis Method:	6010C	Analysis Batch:	280-242836	Instrument ID:	MT_026
Prep Method:	3010A	Prep Batch:	280-242295	Lab File ID:	26a091014b.asc
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	09/10/2014 1541			Final Weight/Volume:	50 mL
Prep Date:	09/09/2014 0800				

DWL 10/23/14

Analyte	Result (ug/L)	Qualifier	DL	LOQ
Calcium	190000		35	1000
Iron	1200		22	100
Magnesium	43000		11	500
Manganese	3300	Q	0.25	10
Potassium	91000		240	3000
Sodium	62000		92	5000

General Chemistry

Client Sample ID: **ST012-W30-WG-090214**

Lab Sample ID: 280-59588-1 Date Sampled: 09/02/2014 1037
Client Matrix: Water Date Received: 09/04/2014 1000

DWK 10/23/14

Analyte	Result	Qual	Units	DL	LOQ	Dil	Method
Bromide	3.5		mg/L	0.11	0.50	1.0	9056A
Analysis Batch: 280-243071	Analysis Date: 09/12/2014 1819						
Chloride	580	"D"	mg/L	2.5	30	10	9056A
Analysis Batch: 280-243071	Analysis Date: 09/13/2014 0535						
Sulfate	18		mg/L	0.23	5.0	1.0	9056A
Analysis Batch: 280-243071	Analysis Date: 09/12/2014 1819						

Data Quality Evaluation Checklists

Method Validated: 8260B

Initial Review by: D. Knaub Date: 10/23/14 SDG#: 280-59588-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (METHODS 8260 AND 8270)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C).	QC acceptance criteria published by DoD, if available; otherwise method- specific criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	NA	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	Ok
MDL Study	At initial set-up and subsequently once per 12-month period; otherwise quarterly MDL verification checks shall be performed (see box D-18)	See 40 CFR 136B. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL verification check at higher level and set MDL higher or reconduct MDL study (see box D-18)	NA	Samples cannot be analyzed without a valid MDL.	Ok
Tuning	Prior to calibration and every 12 hours during sample analysis	Refer to method for specific ion criteria.	Retune instrument and verify. Rerun affected samples.	Flagging criteria are not appropriate	Problem must be corrected. No samples may be accepted without a valid tune.	p. 223 – 228 level IV package VMS_G2, ICAL/ICV, 8/27/14 VMS_G2, ICAL/ICV, 9/04/14 VMS_G2, CCV 9/10/14 VMS_Z, ICAL/ICV 8/11/14 VMS_Z ICAL/ICV 9/04/14 VMS_Z CCV 9/11/14 All ok

Method Validated: 8260B

Initial Review by: D. Knaub Date: 10/23/14 SDG#: 280-59588-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (METHODS 8260 AND 8270)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Breakdown Check (DDT Method 8270C Only)	Daily prior to analysis of samples	Degradation ≤ 20% for DDT	Correct problem then repeat breakdown check	Flagging criteria are not appropriate	No samples shall be run until degradation ≤ 20%. Benzidine and pentachlorophenol should be present at their normal responses and no peak tailing should be observed.	NA
Container, Preservation, and Holding Time	All field samples	8260 – 40 ml VOA vial HCl to pH < 2, Cool to 4°C 14 days to analysis 8270 – 1 L Amber glass, Cool to 4°C 7 days to extraction 40 days to analysis	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collection date: 9/02/14 Analysis date: 9/10/14, 9/11/14 Temp 3.0 °C

Method Validated: 8260B

Initial Review by: D. Knaub Date: 10/23/14 SDG#: 280-59588-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (METHODS 8260 AND 8270)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Minimum Five-Point Initial Calibration For All Analytes (ICAL)	Initial calibration prior to sample analysis	Average response factor (RF) for SPCCs: VOCs - 0.30 for Chlorobenzene and 1,1,2,2-tetrachlorolethane. a 0.1 for chloromethane, bromoform, and 1,1-dicbloroethane. SVOCs - a 0.050. RSD for RFs for CCCs: The CCCs are vinyl chloride, 1,1-dichlorethene, chloroform, 1,2-dichloropropane, toluene, and ethylbenzene. VOCs and SVOCs - 30% and one option below; **Option 1**: RSD for each analyte ≤ 15% **Option 2**: linear least squares regression r a 0.995 **Option 3**: non-linear regression - coefficient of determination (COD) e a 0.99 (6 points shall be used for second order, 7 points shall be used for third order)	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.	p. 252 VMS_G2, 8/27/14 All OK p. 292 VMS_G2, 9/04/14 (short list) All OK p. 314 VMS_Z, 8/11/14 (short list) All OK p. 336 VMS_Z 9/04/14 All OK
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 25% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	p. 377, VMS_G2 ICV 280-240780/14 (8/27/14) p.384,VMS_G2 ICV(short list) 280-241807/13 p. 404, VMS_Z ICV (short list) 280-238260/16 (8/11/14) p. 408 VMS_Z (9/04/14) 280-241805/19 All OK

Method Validated: 8260B

Initial Review by: D. Knaub Date: 10/23/14 SDG#: 280-59588-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (METHODS 8260 AND 8270)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL	Position shall be set using the midpoint standard of the initial calibration curve.	NA			All OK
Evaluation of Relative Retention Times (RRT)	With each sample	RRT of each target analyte in each calibration standard within ± 0.06 RRT units.	Correct problem, then rerun ICAL.			All ok
Calibration Verification (CV)	Daily, before sample analysis, and every 12 hours of analysis time	Average RF for SPCCs: VOCs 0.30 for Chlorobenzene and 1,1,2,2-tetrachlorolethane, 0.1 for chloromethane, bromoform, and 1,1-dichloroethane. SVOCs 0.050. 2. %Difference/Drift for CCCs: VOCs and SVOCs ≤20%D (Note: D = difference when using RFs or drift when using least squares regression or non-linear calibration.)	Correct problem, then rerun CV. If that fails, repeat initial calibration. See section 5.5.10 and DoD clarification box 55.	Apply Q-flag if no sample material remains and analyte exceeds criteria.	NA	p. 388, VMS_G2 CCV 280-242744/2 (9/10/14) p. 395 VMS_G2 CCV (short list) 280-242744/2 (9/10/14) p. 415, VMS_Z CCV 280-242801/2 (9/11/14) p. 427 VMS_Z CCV (short list) 280-242801/3 All COIs OK
Internal Standards Verification	In all field samples and standards	Retention time ± 30 seconds from retention time of the midpoint standard in the ICAL EICP area within - 50% to + 100% of ICAL midpoint standard	Inspect mass spectrometer and GC for malfunctions. Reanalysis of samples analyzed while system was malfunctioning is mandatory.	If corrective action fails in field samples, apply Q-flag to analytes associated with the non-compliant IS. Flagging criteria are not appropriate for failed standards.	Flagging criteria are not appropriate.	p. 229 -234 ICIS 280-240780/11 ICIS 280-241807/10 ICIS 280-238260/13 All ok

Method Validated: 8260B

Initial Review by: D. Knaub Date: 10/23/14 SDG#: 280-59588-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (METHODS 8260 AND 8270)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Method Blank	One per preparatory batch	No analytes detected >½ RL. For common laboratory contaminants, no analytes detected > RL.	Correct problem, then see criteria in box D-5. If required, reprep and reanalyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch.		p.40 MB 280-242744/7 MeCl = 1.01 x 10 = 10.1 ug/L ***Flag ST012-W30-WG-090214, and TB01-090314 as "B"*** p. 42 MB0280-242801/6 All ND
LCS Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	QC acceptance criteria specified by DoD, if available; see box D-7 and Appendix DoD-D.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. (See full explanation in Appendix DoDID.	If corrective action fails, applyIQ-flag to specific analyte(s) in all samples in the associated preparatory batch.		p.41 LCS 280-242744/6 All OK p. 43 LCS 280-242801/4 All OK
MS	One MS per preparatory batch per matrix (see box D- 15)	For matrix evaluation, use QC acceptance criteria specified by DoD for LCS.	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	Lab: For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error	No MS/MSD submitted for method 8260B
MSD or Sample Duplicate	One per preparatory batch per matrix	RPD ≤ 30% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	Lab: For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	NA -See above

Method Validated: 8260B

Initial Review by: D. Knaub Date: 10/23/14 SDG#: 280-59588-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (METHODS 8260 AND 8270)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Surrogate Spike (Analytes Identified in Appendix DoD-D)	All field and QC samples	QC acceptance criteria for LCS published by DoD, if available; otherwise method- specified criteria or laboratory's own in-house criteria.	For QC and field samples, correct problem, then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available.	For the specific analyte(s) in all field samples collected from the same site matrix as the parent, apply J-flag if acceptance criteria are not met. For QC samples, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.		p. 37 All OK.
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤30%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		None in this SDG
Results Reported Between MDL and LOQ	NA	NA	NA	Apply J-flag to all results between MDL and LOQ. Validator flags: If using AFCEE; Apply "F" flag		Samples qualified as estimated and AFCEE flagged "F" unless overridden by flags for other criteria
QC Blanks (Trip Blanks, Equipment Blanks, and Field Blanks)	Trip Blank – one per cooler containing samples for VOCs Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B"		TB01-090314 MeCl = 0.36ug/L – ***flagged "B" due to method blank – no qualification required for samples.***

Method Validated: 8015B (TPH-GRO) Initial Review by: D. Knaub Date: 10/23/14 SDG#:280-59588-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	ok
Method Detection Limit (MDL) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly MDL verification checks shall be performed (see box 0-18)	See 40 CFR 1368. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL verification check at higher level and set MDL higher or reconduct MDL study (see box D-18).	NA	Samples cannot be analyzed without a valid MDL.	ok
Retention Time (RT) Window Width Calculated for Each Analyte and Surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 72-hour study.	NA	NA		
Breakdown Check (Endrin/ DDT Method 8081 Only)	Daily prior to analysis of samples	Degradation ≤ 15% for both Endrin and DDT.	Correct problem then repeat breakdown check.	Flagging criteria are not appropriate	No samples shall be run until degradation ≤ 15%.	NA TPH-GRO

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Container, Preservation, and Holding Time	All field samples	GRO- Water: 40 ml VOA vial; HCl to pH < 2, Cool to 6°C Soil: (low-level) 5 g in 40 ml VOA w/H_2O or sodium bisulfate; Cool to 6°C (high-level) 5 g in 40 ml VOA w/methanol, Cool to 6°C, or EnCore® or equivalent (48 hrs to preservation) 14 days to analysis DRO – Water: 1 L Amber glass, Cool to 6°C Soil: 4 oz amber glass jar, Cool to 6°C Water: 7 days to extraction Soil: 14 days to extraction 40 days to analysis	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collected: 9/02/14 Temp=3.0**°C** Analyzed: 9/09/14, 9/12/14 ***ok***

Method Validated: 8015B (TPH-GRO) Initial Review by: D. Knaub Date: 10/23/14 SDG#:280-59588-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Minimum Five-Point Initial Calibration For All Analytes (ICAL)	Initial calibration prior to sample analysis	One of the options below (except for Method 8082, which may only use Option 1 or 2): Option 1: RSD for each analyte ≤ 20% Option 2: linear least squares regression: r 2 ≥0.995 Option 3: non-linear regression: coefficient of determination (COD) r2 ≥0.99 (6 points shall be used for second order, 7 points shall be used for third order)	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed. For PCB analysis, a mixture of Aroclors 1016 and 1260 is normally used to establish detector calibration linearity, unless project-specific data suggest the presence of another Aroclor (e.g., 1232). In addition, a mid-level or lower standard for each of the remaining Aroclors is analyzed for pattern recognition and response factor.	p. 533 Inst VGC_Q 3/12/14 OK
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 20% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	p. 561 ICV 280-216544/11 3/12/14 Inst VGC_Q
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL and at the beginning of the analytical shift	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift.	NA	NA		p. 532 ICAL

Method Validated: 8015B (TPH-GRO) Initial Review by: D. Knaub Date: 10/23/14 SDG#:280-59588-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time Window Verification for Each Analyte and Surrogate	Each calibration verification standard	Analyte within established window	Correct problem, then reanalyze all samples analyzed since the last acceptable retention time check. If they fail, redo ICAL and reset retention time window,	Flagging criteria are not appropriate for initial verification. For CCV, apply a Q-flag to all results for analytes outside the established window.	No samples shall be run without a verified retention time window at the initial verification. For method 8015, check state methods for use of modified retention time markers with gasoline range organics (GRO) or diesel range organics (DRO).	p. 562 ICV p. 568, 575, 582, 589, 596 CCVs
Calibration Verification (Initial [ICV] and Continuing [CCV])	ICV: Daily, before sample analysis CCV: After every 10 field samples and at the end of the analysis sequence	All analytes within ± 20% of expected value from the ICAL	ICV: Correct problem, rerun ICV. If that fails, repeat initial calibration. See section 5.5.10 and box 55. CCV: Correct problem then repeat CCV and reanalyze all samples since last successful calibration verification.	ICV: Flagging criteria are not appropriate. CCV: Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification, if . reanalysis is not possible.	If %D for an individual analyte is > 20%, no samples may be analyzed until the problem has been corrected.	p. 561 ICVRT 280-216544/11 3/12/14 Inst VGC_Q OK p. 567 CCV 280-242714/4 9/09/14 Inst VGC_Q OK p. 574 CCV 280-242714/19 9/09/14 Inst VGC_Q OK p. 581 CCV 280-242714/26 9/10/14 Inst VGC_Q OK p. 588 CCV 280-243077/3 9/12/14 Inst VGC_Q OK p. 595 CCV 280-243077/19 9/12/14 Inst VGC_Q OK

Method Validated: 8015B (TPH-GRO) Initial Review by: D. Knaub Date: 10/23/14 SDG#:280-59588-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Method Blank	One per preparatory batch	No analytes detected > ½RL. For common laboratory contaminants, no analytes detected > RL.	Correct problem, then see criteria in box 0-5; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch		p. 44 MB 280-242714/5 ND p. 46 MB 280-243077/4 ND
Laboratory Control Sample (LCS) Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	QC acceptance criteria specified by DoD, if available; see box D-7 and Appendix DoD-D .	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix DoD D)	If corrective action fails apply J-flag to specific analyte(s) in all samples in the associated preparatory batch		p. 44, LCS/LCSD 280-24214/6,7 GRO = 83, 85 OK p. 46 LCS/LCSD 280-243077/5,6 GRO = 119, 109
Matrix Spike (MS)	One MS per preparatory batch per matrix (see box ID- 11)	For matrix evaluation, use QC acceptance criteria specified by DoD for LCS.	Examine the project-specific DQOs. Contact the client as to additional measures to be taken,	Lab: For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	No MS/MSD submitted with this SDG
Matrix Spike Duplicate (MSD) or Sample Duplicate	One per preparatory batch per matrix	RPD ≤30% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	Lab: For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	No MSD performed with this SDG

Method Validated: 8015B (TPH-GRO) Initial Review by: D. Knaub Date: 10/23/14 SDG#:280-59588-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤30%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		None in this SDG
Surrogate Spike (Analytes Identified in Appendix DoD-D)	All field and QC samples	QC acceptance criteria for LCS specified by DoD, if available; otherwise method- specified criteria or laboratory's own in-house criteria	For QC and field samples, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	For the specific analyte(s) in all field samples collected from the same site matrix as the parent, apply J-flag if acceptance criteria are not met. For QC samples, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	Alternative surrogates are recommended when there is obvious chromatographic interference.	p. 38 ST012-W30-WG-090214= 154% ***Flag assoc. result "J"***
Confirmation of Positive Results (Second Column or Second Detector)	All positive results must be confirmed (in Method 8081A exclude toxaphene and technical chlordane, in Method 8015B exclude GRO, DRO, and residual range organics (RRO)).	Calibration and QC criteria same as for initial or primary column analysis. Results between primary and second column RPD ≤ 40%.	NA	Apply J-flag if RFD > 40% or Q-flag if sample is not confirmed. Discuss in the case narrative.	Report the higher of two confirmed results unless overlapping peaks are causing erroneously high results, then report the non- affected result and document in the case narrative.	NA

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between LOD and LOQ. Validator flags: If using AFCEE; Apply "F" flag		No targets detected between LOD and LOQ
QC Blanks (Trip Blanks, Equipment Blanks, and Field Blanks)	Trip Blank – one per cooler containing samples for volatile parameters Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B"		TB01-090314 ND for GRO

Method Validated: 8015B (TPH-DRO) Initial Review by: D. Knaub Date: 10/23/14 SDG#:280-59588-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	ok
Method Detection Limit (MDL) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly MDL verification checks shall be performed (see box 0-18)	See 40 CFR 1368. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL verification check at higher level and set MDL higher or reconduct MDL study (see box D-18).	NA	Samples cannot be analyzed without a valid MDL.	ok
Retention Time (RT) Window Width Calculated for Each Analyte and Surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 72-hour study.	NA	NA		
Breakdown Check (Endrin/ DDT Method 8081 Only)	Daily prior to analysis of samples	Degradation ≤ 15% for both Endrin and DDT.	Correct problem then repeat breakdown check.	Flagging criteria are not appropriate	No samples shall be run until degradation ≤ 15%.	NA TPH-DRO

Method Validated: 8015B (TPH-DRO) Initial Review by: D. Knaub Date: 10/23/14 SDG#:280-59588-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Container, Preservation, and Holding Time	All field samples	GRO- Water: 40 ml VOA vial; HCl to pH < 2, Cool to 6°C Soil: (low-level) 5 g in 40 ml VOA w/H_2O or sodium bisulfate; Cool to 6°C (high-level) 5 g in 40 ml VOA w/methanol, Cool to 6°C, or EnCore® or equivalent (48 hrs to preservation) 14 days to analysis DRO – Water: 1 L Amber glass, Cool to 6°C Soil: 4 oz amber glass jar, Cool to 6°C Water: 7 days to extraction Soil: 14 days to extraction 40 days to analysis	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collected: 9/02/14 Temp= 3.0 **°C** Extracted; 9/04/14 Analyzed: 9/09/14 ***ok***

Method Validated: 8015B (TPH-DRO) Initial Review by: D. Knaub Date: 10/23/14 SDG#:280-59588-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Minimum Five-Point Initial Calibration For All Analytes (ICAL)	Initial calibration prior to sample analysis	One of the options below (except for Method 8082, which may only use Option 1 or 2): Option 1: RSD for each analyte ≤ 20% Option 2: linear least squares regression: r 2 ≥0.995 Option 3: non-linear regression: coefficient of determination (COD) r2 ≥0.99 (6 points shall be used for second order, 7 points shall be used for third order)	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed. For PCB analysis, a mixture of Aroclors 1016 and 1260 is normally used to establish detector calibration linearity, unless project-specific data suggest the presence of another Aroclor (e.g., 1232). In addition, a mid-level or lower standard for each of the remaining Aroclors is analyzed for pattern recognition and response factor.	p. 651 Inst SGC_U 7/16/14 OK
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 20% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	p. 689 ICV 280-234596/11 7/16/14 Inst SGC_U
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL and at the beginning of the analytical shift	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift.	NA	NA		p. 650 ICAL

Method Validated: 8015B (TPH-DRO) Initial Review by: D. Knaub Date: 10/23/14 SDG#:280-59588-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time Window Verification for Each Analyte and Surrogate	Each calibration verification standard	Analyte within established window	Correct problem, then reanalyze all samples analyzed since the last acceptable retention time check. If they fail, redo ICAL and reset retention time window,	Flagging criteria are not appropriate for initial verification. For CCV, apply a Q-flag to all results for analytes outside the established window.	No samples shall be run without a verified retention time window at the initial verification. For method 8015, check state methods for use of modified retention time markers with gasoline range organics (GRO) or diesel range organics (DRO).	p. 690 ICV p. 697 CCV p. 704 CCV
Calibration Verification (Initial [ICV] and Continuing [CCV])	ICV: Daily, before sample analysis CCV: After every 10 field samples and at the end of the analysis sequence	All analytes within ± 20% of expected value from the ICAL	ICV: Correct problem, rerun ICV. If that fails, repeat initial calibration. See section 5.5.10 and box 55. CCV: Correct problem then repeat CCV and reanalyze all samples since last successful calibration verification.	ICV: Flagging criteria are not appropriate. CCV: Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification, if . reanalysis is not possible.	If %D for an individual analyte is > 20%, no samples may be analyzed until the problem has been corrected.	p. 689 ICV 280-234596/11 7/16/14 Inst SGC_U p. 696 CCV 280-242565/4 9/09/14 Inst SGC_U p. 703 CCV 280-242565/12 9/09/14 Inst SGC_U
Method Blank	One per preparatory batch	No analytes detected > ½RL. For common laboratory contaminants, no analytes detected > RL.	Correct problem, then see criteria in box 0-5; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch		p. 48 MB 280-241972/1-A DRO=ND

Method Validated: 8015B (TPH-DRO) Initial Review by: D. Knaub Date: 10/23/14 SDG#:280-59588-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Laboratory Control Sample (LCS) Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	QC acceptance criteria specified by DoD, if available; see box D-7 and Appendix DoD-D .	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix DoD D)	If corrective action fails apply J-flag to specific analyte(s) in all samples in the associated preparatory batch		p. 48 LCS/LCSD 280-241972/ 2-A,3-A DRO = 70, 84 RPD = 17
Matrix Spike (MS)	One MS per preparatory batch per matrix (see box ID- 11)	For matrix evaluation, use QC acceptance criteria specified by DoD for LCS.	Examine the project-specific DQOs. Contact the client as to additional measures to be taken,	Lab: For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	No MS/MSD submitted with this SDG
Matrix Spike Duplicate (MSD) or Sample Duplicate	One per preparatory batch per matrix	RPD ≤30% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	Lab: For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	No MSD or lab dup performed with this SDG
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤30%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		None in this SDG

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Surrogate Spike (Analytes Identified in Appendix DoD-D)	All field and QC samples	QC acceptance criteria for LCS specified by DoD, if available; otherwise method- specified criteria or laboratory's own in-house criteria	For QC and field samples, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	For the specific analyte(s) in all field samples collected from the same site matrix as the parent, apply J-flag if acceptance criteria are not met. For QC samples, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	Alternative surrogates are recommended when there is obvious chromatographic interference.	p. 39 **All ok**
Confirmation of Positive Results (Second Column or Second Detector)	All positive results must be confirmed (in Method 8081A exclude toxaphene and technical chlordane, in Method 8015B exclude GRO, DRO, and residual range organics (RRO)).	Calibration and QC criteria same as for initial or primary column analysis. Results between primary and second column RPD ≤ 40%.	NA	Apply J-flag if RFD > 40% or Q-flag if sample is not confirmed. Discuss in the case narrative.	Report the higher of two confirmed results unless overlapping peaks are causing erroneously high results, then report the non- affected result and document in the case narrative.	NA
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between LOD and LOQ. Validator flags: If using AFCEE; Apply "F" flag		No targets detected between LOD and LOQ

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
QC Blanks (Trip Blanks, Equipment Blanks, and Field Blanks)	Trip Blank – one per cooler containing samples for volatile parameters Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B"		No EB

Method Validated: 6010

Initial Review by: D. Knaub Date: 10/23/14 SDG#:280-59588-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETRY (METHOD 6010)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	Ok
Instrument Detection Limit (IDL) Study	At initial set-up and after significant change in instrument type, personnel, test method, or sample matrix	IDL shall be ≤ Limit of Detection (LOD)	NA	NA		p. 748 6/11/13
Container, Preservation, and Holding Time	All field samples	Water: 500 ml Poly, HNO_3 to pH < 2, Cool to 6°C, Soil: 4 oz glass or poly jar, Cool to 6°C 180 days to analysis	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collection date: 9/02/14 Prep; 9/09/14 Analysis date: 9/10/14 Temp:3.0 °C
Initial calibration (ICAL) for all analytes (minimum one high standard and a calibration blank)	Daily ICAL prior to sample analysis	If more than one calibration standard is used, r ≥ 0.995.	Correct problem then repeat ICAL.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.	p. 758 run log ICIS analyzed 9/10/2014 11:24 IC analyzed 9/10/2014 11:27 and 11:30

Method Validated: 6010 | Initial Review by: D. Knaub | Date: 10/23/14 | SDG#:280-59588-1
Senior Review by: J. Hartness | Date: 10/27/14 | Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETRY (METHOD 6010)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Second Source Calibration Verification (ICV)	Once after each ICAL, prior to beginning sample run	Value of second source for all analytes within ± 10% of true value	Correct problem and verify second source standard. Rerun ICV. If that fails, correct problem and repeat ICAL.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	p. 734 ICVH 280-242836/6 9/10/2014 All OK p. 735 ICV 280-242836/8 9/10/2014 All OK p. 737 ICVL 280-242836/10 9/10/2014 All OK
Continuing Calibration Verification (CCV)	After every 10 field samples and at the end of the analysis sequence	All analytes within ± 10% of true value	Correct problem, rerun CCV. If that fails, then repeat ICAL. Reanalyze all samples since last successful calibration verification	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q-flag to all results for the specific analyte(s) of interest in all samples since the last acceptable CCV. Validator flags: If using AFCEE; Apply "J" flag only if reanalysis cannot be performed	Problem must be corrected. Results may not be reported without a valid CCV. Flagging is only appropriate in cases where the samples cannot be reanalyzed.	p. 734 CCVH 280-242836/24,35 9/10/14 All OK p. 735 CCV 280-242265/9, 25, 36 9/10/14 All OK p. 737 CCVL 280-242836/27, 38 9/10/14 Ca = 118% *No flag, associated sample result very high*
Low-level calibration check standard	Daily, after one-point ICAL	Within ± 20% of true value	Correct problem, then reanalyze	Flagging criteria are not appropriate.	No samples may be analyzed without a valid low-level calibration check standard. Low-level calibration check standard should be less than or equal to the reporting limit.	p. 738 ***All OK***

Method Validated: 6010 | Initial Review by: D. Knaub | Date: 10/23/14 | SDG#:280-59588-1
Senior Review by: J. Hartness | Date: 10/27/14 | Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETRY (METHOD 6010)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Linear dynamic range or high-level check standard	Every 6 months -	Within ±10% of expected value	NA	NA		p. 756 7/21/14
Method Blank	One per preparatory batch	No analytes detected > ½ RL and greater than 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL (see Box D-1).	Correct problem, then see criteria in box D-1; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch	Problem must be corrected. Results may not be reported without a valid method blank. Flagging is only appropriate in cases where samples cannot be reanalyzed.	p. 50 MB-280-242295/1-A Ca = 375 5x = 1875 *Assoc. result > 5x blank, no flags necessary*
Calibration blank	Before beginning a sample run, after every 10 samples, and at end of the analysis sequence	No analytes detected > LOD	Correct problem. Reprep and reanalyze calibration blank. All samples following the last acceptable calibration blank must be reanalyzed	Apply B-flag to all results for specific analyte(s) in all samples associated with the blank.		p. 739 9/10/14 ICB/CCBs 280-242836/13 ND 280-242836/26, 37 Mn = 0.270 J x 5 = 1.35 ug/L Mn = 0.330 J x 5 = 1.65 ug/L *Mn detected in samples at 5x greater than CCB: No qualification required*
Interference check solutions (ICS-A and ICS-AB)	At the beginning of an analytical run and every 12 hours	ICS-A: Absolute value of concentration for all non-spiked analytes < LOD (unless they are a verified trace impurity from one of the spiked analytes) ICS-AB: Within ±20% of expected value	Terminate analysis, locate and correct problem, reanalyze ICS, reanalyze all samples.	If corrective action fails, apply Q-flag to all results for specific analyte(s) in all samples associated with the ICS. Validator flags: If using AFCEE; Apply "M" flag		p. 741 9/10/14 ICSA - ICS-A Mn >LOD *No qualification- vendor verified trace impurities* p. 742 9/10/14 ICS-AB All OK

Method Validated: 6010 | Initial Review by: D. Knaub | Date: 10/23/14 | SDG#:280-59588-1
Senior Review by: J. Hartness | Date: 10/27/14 | Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETRY (METHOD 6010)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Laboratory Control Sample (LCS) Containing All Analytes to be Reported	One per preparatory batch	QC acceptance criteria specified by DoD, if available; see box D-3 and Appendix G.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix G)	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch Validator flags: If using AFCEE; Apply "J" flag	Problem must be corrected. Results may not be reported without a valid LCS. Flagging is only appropriate in cases where the samples cannot be reanalyzed.	p. 50 LCS-280-242295/2-A 9/10/14 All OK
Matrix Spike (MS)	One per preparatory batch per matrix (see box D-7)	For matrix evaluation, use QC acceptance criteria specified by DoD for LCS.	Examine the project-specific DQOs. If the matrix spike falls outside of DoD criteria, additional quality control test (dilution test and post-digestion spike addition) are required to evaluate matrix effects.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	p. 51 ST012-W30-WG-090214 All ok
Matrix Spike Duplicate (MSD)	One per preparatory batch per matrix (see Box D-7)	MSD: For matrix evaluation use QC acceptance criteria specified by DoD for LCS MSD RPD < 20%	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	p. 51 ST012-W30-WG-090214 RPDs All ok
Dilution test	Once per preparatory batch	Five-fold dilution must agree within ± 10% of the original measurement	Perform post-digestion spike addition.	Flagging criteria are not appropriate.	Only applicable for samples with concentrations > 50 x LOQ.	p. 52 ST012-W30-WG-090214 All OK
Post digestion spike addition	When dilution test fails or analyte concentration for all samples < 50 x LOQ	Recovery within 75-125% of (see Table B-1)	Run all associated samples in the preparatory batch by method of standard additions (MSA) or see flagging criteria.	For specific analyte(s) in the parent sample, apply J-flag of acceptance criteria are not met.	Spike addition should produce a concentration of 10 - 100 x LOQ	p. 51 Ca = 70% Mn = -61% ***No qualification: sample results greater than 4x spike amount***

Method Validated: 6010 | Initial Review by: D. Knaub | Date: 10/23/14 | SDG#:280-59588-1
Senior Review by: J. Hartness | Date: 10/27/14 | Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETRY (METHOD 6010)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Method of standard additions (MSA)	When matrix interference is suspected	NA	NA	NA	Document use of MSA in the case narrative.	NA
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD 20%	Qualify samples	For the specific analyte(s) in the parent & dup samples, apply J-flag if acceptance criteria are not met.		None in this SDG
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between DL and LOQ. Validator flags: If using AFCEE; Apply "F" flag		Results reported between MDL and RL flagged "F" for AFCEE.
QC Blanks (Equipment Blanks, and Field Blanks)	Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value are qualified as estimated and flagged "B".		No EB

Method Validated: 9056A

Initial Review by: D. Knaub Date: 10/23/14

Senior Review by: J. Hartness Date: 10/27/14

SDG#: 280-59588-1

Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	ok
Limit of Detection Determination and Verification (LOD) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOD verification checks shall be performed (see box D-13)	See 40 CFR 1368. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL / LOD verification check at higher level and set MDL higher or reconduct MDL study (see box D-13).	NA	Samples cannot be analyzed without a valid MDL.	p. 1033 6/16/2013
Limit of Quantitation Establishment and Verification (LOQ) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOQ verification checks shall be performed (see box D-14)	Within calibration range including low standard; within method precision and accuracy.	Re-run LOQ	NA	Samples cannot be analyzed without a valid LOQ	MRL check: Level 4 Package Pg. 1032 (9/12/14) = All OK

Method Validated: 9056A

Initial Review by: D. Knaub Date: 10/23/14

Senior Review by: J. Hartness Date: 10/27/14

SDG#: 280-59588-1

Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time (RT) Window Width Calculated for Each Analyte and Surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 24-hour study.	NA	NA		OK
Container, Preservation, and Holding Time	All field samples	500 ml poly, Cool to 4°C Nitrate – 48 hours Nitrite, sulfate, chloride – 28 days	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collected: 9/02/14 Temp: 3.0°C Analyzed: 9/12/14, 9/13/14
ICAL for All Analytes (Minimum Three Standards and One Calibration Blank)	Initial calibration prior to sample analysis	R ≥ 0.995	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.	p. 1036 Level IV package 9/04/14 6 levels Inst. IC7 OK
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 10% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	p. 1047 Level 4 Package OK
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL and at the beginning of the analytical shift	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift.	NA	NA		OK

Method Validated: 9056A

Initial Review by: D. Knaub Date: 10/23/14

Senior Review by: J. Hartness Date: 10/27/14

SDG#: 280-59588-1

Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Midrange Continuing Calibration Verification (CCV)	After every 10 field samples and at end of the analysis sequence.	All analytes within established retention time windows and within ± 10% of true value	Correct problem then repeat CCV. If that fails, then repeat ICAL. Reanalyze all samples since last successful calibration verification.	Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification, if . reanalysis is not possible.	No samples may be analyzed until the problem has been corrected.	p. 1025 Level IV Package 9/12/14 All OK
Method Blank	One per preparatory batch	No analytes detected > ½ RL. See box D-1.	Correct problem, then see criteria in box D-1; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	Lab: Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch. Validator; Apply "B" flag if result is less than 5x method blank.		p. 53 MB 280-243071/6 All ND p. 1025: CCBs - All ND
Laboratory Control Sample (LCS) Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	Use laboratory in-house LCS acceptance criteria (not to exceed 20%).See Box D-3.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix G)	If corrective action fails apply J-flag to specific analyte(s) in all samples in the associated preparatory batch		p. 54 Br = 102, 94 Cl = 100, 92 SO4 = 103, 93 All OK

Method Validated: 9056A

Initial Review by: D. Knaub Date: 10/23/14

Senior Review by: J. Hartness Date: 10/27/14

SDG#: 280-59588-1

Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Matrix Spike (MS)	One MS per preparatory batch per matrix (see box D- 7)	For matrix evaluation, use laboratory in-house LCS acceptance criteria (not to exceed 20%).	Examine the project-specific 000s. Contact the client as to additional measures to be taken,	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	p. 55 ST012-W30-WG-090214 *Br = 116, 116* *Cl = 49, 49* SO4 = 109, 110 No flag for Cl, anal. at 10x dilution Flag assoc. Br result as "M"
Matrix Spike Duplicate (MSD) or Sample Duplicate	One per preparatory batch per matrix	RPD ≤15% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	RPDs OK
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤10%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		No field dups in this SDG p. 56 Lab dup on ST012-W30-WG-090214, RPDs OK
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between LOD and LOQ. Validator flags: If using AFCEE; Apply "F" flag		No detections between LOD and LOQ
QC Blanks (Equipment Blanks and Field Blanks)	Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B".		No EB

Data Evaluation Narrative
AMEC Project: Former Williams AFB
AMEC Project Number: 9101110001.5300.5301
Site: ST012 – Enhanced Bioremediation Field Test
Sampling Event: September 2014
Matrix: Groundwater

SDG: 280-59740-1

1.0 INTRODUCTION

A data quality evaluation (DQE) was performed on the data reported for the Enhanced Bioremediation field test conducted at Site ST012 in September 2014, at the former Williams Air Force Base (AFB), Mesa, Arizona. The following sections provide summary discussions of the required data qualifications for each site and analytical methods for samples collected at the former WAFB. Data validation was conducted on 100% of the primary samples and field quality control samples (trip blanks, rinsate blanks, sample duplicates, and matrix spike/matrix spike duplicate [MS/MSD] samples). A Level III (Step IIB) data validation was performed using supplemental checklists to review the following quality control elements: laboratory case narrative, sample documentation, chain-of-custody, holding time protocols, method-specific calibration information, mass tunes, method blank results, laboratory control sample (LCS) results, surrogate recoveries (where applicable), MS/MSD recoveries and relative percent differences (RPDs), field duplicate RPDs, trip and equipment/rinsate blanks, method-specific QC elements (such as interelement check standards (ICS), serial dilutions, post digestion spikes (PDS), column breakdown, etc.), method sensitivity, and completeness. The Level III DQE checklists are attached to this narrative.

Data were reviewed using precision and accuracy control limits presented in The Department of Defense (DoD) Quality Systems Manual (QSM) Version 4.2 (DoD, 2010). DQE data qualifications were applied if necessary in accordance with procedures in Air Force Center for Environmental Excellence (AFCEE) Quality Assurance Project Plan (QAPP), Version 4.0.01 (AFCEE, 2005), the method, and professional judgment using the following qualifiers:

J = The reported concentration is considered an estimated value due to discrepancies in meeting certain analyte-specific quality control criteria.
F = The reported concentration is between the limit of quantitation/reporting limit (LOQ/RL) and method detection limit (MDL) and is considered an estimated value
UJ = The target compound was not detected and the reporting limit is considered imprecise due to discrepancies in meeting certain analyte-specific quality control criteria.
B = The result may be biased high or a false positive based on blank data.
M = The reported concentration is estimated due to matrix effects.
R = The data are considered unusable due to discrepancies in meeting certain quality control criteria and may not be used in decision making.

2.0 DELIVERABLES

The data packages as submitted to AMEC Environment and Infrastructure, Inc. (AMEC) are complete as stipulated in the Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) for Site ST012 Enhanced Bioremediation Field Test Plan (AMEC, 2014), and the applicable guidelines described in the former Williams AFB Performance Based Remediation Program QAPP and standard operating procedures (SOPs) (collectively referred to as the QAPP/SOP [AMEC, 2012]) for U.S. States Environmental Protection Agency (EPA) Methods SW8260B, SW8015B, SW9056A, and SW6010C.

3.0 SAMPLE INTEGRITY

Samples within this sample delivery group (SDG) collected from ST012 were submitted to TestAmerica Laboratories (TAL) in Denver, Colorado for select volatile organic compounds (VOCs) analysis by USEPA Method SW8260B, total petroleum hydrocarbons-gasoline range organics (TPH-GRO) and diesel range organics (TPH-DRO) by Method SW8015B, anions by Method SW9056A and select metals by Method SW6010C.

Based on the information provided on the cooler receipt forms, samples arrived at the laboratory within the recommended temperature and preservation requirements. Completed Chain-of-Custody (COC) documents are included in the data package.

4.0 SAMPLE IDENTIFICATION

This SDG contains the following water and quality control (QC) samples:

Site: ST012	QC Samples
ST012-W11-WG-090814	TB01-090814

These samples were collected on 8 September 2014.

5.0 SAMPLE QUALIFICATION

Only those components that required qualification of the data are presented in this narrative. All Level III components were within the DoD QSM QC limits, with the following exceptions:

- Constituents were present in the associated blanks and flagged “B” (no flags applied).
- Surrogate recoveries were outside QC limits and results flagged “J”
- Metals were detected in the Interference Check Solution A (ICSA) (no qualification required).
- PDS recoveries were outside QC limits for one metal (no flags applied).
- Results were present between the MDL and LOQ and flagged “F”.

6.0 VOCS (SW8260B)

Samples collected from site ST012 were submitted for VOCs by EPA Method SW8260B and analyzed for site-specific VOC compounds of interest (COIs).

A Level III validation was performed on this method and only those components that exceeded the QAPP/SOP criteria are presented below. Each of the Level III components was within the QAPP/SOP QC criteria; however the following qualification was noted:

- Results were present between the MDL and LOQ and flagged "F".

6.1 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of VOCs by USEPA Method SW 8260B except where dilutions were required to place the constituent within the calibration range. No dilutions were required on samples from this SDG.

Any result reported between the LOQ and MDL is considered a quantitative estimate. Any result reported between the LOQ and MDL is considered a quantitative estimate. The results reported between the RL and MDL are presented in the attached data report.

Action: The associated results reported between the LOQ and MDL were qualified as estimated and flagged "F" unless overridden by other QC criteria.

7.0 TPH-GRO (8015B)

Samples collected from Site ST012 were submitted for TPH-GRO analysis by EPA Method SW8015B. A Level III validation was performed on this method and only those components that exceeded the program document QAPP/SOP criteria are presented below. Qualification was required for the following:

- Surrogate recoveries were outside QC limits and associated results flagged "J".

7.1 Surrogate Recoveries

Surrogate a,a,a-trifluorotoluene recovered above the QC limits in sample ST012-W11-WG-090814. No qualification is required if the samples were diluted or the surrogate recoveries were high and the sample results were non-detect.

Action: The GRO result for sample ST012-W11-WG-090814 was qualified as estimated and flagged "J".

7.2 Limits of Quantitation

The LOQ as specified in the QAPP/SOP (AMEC, 2012) was met for samples submitted for the analysis of TPH-GRO by EPA Method SW8015B except where dilutions were required to place the constituent within the calibration range. No samples from this SDG required a dilution for GRO.

8.0 TPH-DRO (8015B)

Samples collected from Site ST012 were submitted for TPH-DRO analysis by EPA Method SW8015B. A Level III validation was performed on this method and each of the components met the program document QAPP/SOP criteria.

8.1 Limits of Quantitation

The LOQ as specified in the QAPP/SOP (AMEC, 2012) was met for samples submitted for the analysis of TPH-DRO by EPA Method SW8015B. Dilutions were not required for TPH-DRO.

9.0 ANIONS (SW9056A)

Samples collected from site ST012 were submitted for Anions by Method SW9056A. A Level III validation was performed on this method and only those components that exceeded the QAPP/SOP criteria are presented below. Each of the Level III components was within the QAPP/SOP QC criteria; however the following qualification was noted:

- Constituents were present in the associated blanks and flagged "B" (no flags applied).

9.1 Continuing Calibration Blank

One of the CCBs associated with the samples in this SDG reported low levels of chloride.

Action: No qualification was necessary for chloride because the associated sample result was greater than five times the blank value.

9.2 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of Anions by USEPA Method SW 9056A with the exception of analytes that required dilution. The sample in this SDG required dilution for bromide, chloride, and sulfate resulting in elevated LOQs. The laboratory indicated a dilution with a "D" qualifier which was subsequently removed during the validation process.

10.0 METALS (SW6010C)

Samples collected from Site ST012 were submitted for the major metal cations by EPA Method SW6010C. Samples were analyzed for calcium, iron, magnesium, manganese, potassium, and sodium. A Level III validation was performed on this method and only those components that exceeded the SAP/TAL SOP criteria are presented below. The following components exceeded the QC criteria or were noted:

- Initial and continuing calibration standards recovered outside of QC limits and results flagged "UJ".
- Metals were detected in the Interference Check Solution A (ICSA) (no qualification required).
- PDS recoveries were outside QC limits for two metals (no flags applied).

10.1 Initial and Continuing Calibration Verification

The low level ICVs and/or CCVs recovered below the QC limit for calcium and iron, therefore only low-level results require qualification.

Action: No qualification was required for calcium because calcium was not reported from that particular analytical run. The associated iron result in sample ST012-W11-WG-090814 was qualified as estimated and flagged "UJ".

10.2 Interference Check Solution A (ICSA)

Manganese was detected in the ICSA solution associated with prep batch 280-242657. The vendor verified that the ICSA contained these trace impurities.

Action: No qualification is required for impurities verified by the vendor.

10.3 Post Digestion Spike

The laboratory performed a PDS on sample ST012-W11-WG-090814 and the recoveries for magnesium were outside of the QC limits. No qualification is required if the recoveries were high and the samples were non-detect or the analyte was present in the sample at concentrations greater than 4x the spike amount.

Action: No qualification was required for magnesium results because the metals were present in the sample at greater than 4x the spike amount.

10.4 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of metals by USEPA Method SW6010C except where dilutions were required to place the constituent concentration within the calibration range. No Dilutions were required.

11.0 OVERALL SITE EVALUATION AND PROFESSIONAL JUDGMENT

Edits to the DQE qualifiers by professional judgment were not required.

12.0 SUMMARY OF DATA QUALITY INDICATORS

This section provides an assessment of the data based on project data quality indicators (DQIs) described on QAPP Worksheet #37 of the Program Document QAPP/SOP (AMEC, 2012). The DQIs consist of precision, accuracy, representativeness, comparability, completeness, and sensitivity.

12.1 Precision

An assessment of precision of analytical data is accomplished via review of field duplicate and MS/MSD analyses. Field duplicate and MS/MSD analyses are used to assess field variability, which includes sample collection/handling as well as matrix homogeneity. Precision is expressed as the relative percent difference (RPD) between results for duplicate pairs.

No field duplicate samples or project specific MS/MSDs were submitted. An MS/MSD was performed on a project sample for metals and the RPDs were within QC limits. Precision for TPH-GRO, TPH-DRO, and anions was evaluated through the analysis of the LCS/LCSD and the RPDs were compliant with the QAPP/SOP. The overall method and sample matrix precision are acceptable and achieve project objectives.

12.2 Accuracy (Bias)

An assessment of accuracy of analytical data is accomplished via evaluation of the spike recoveries in the MS/MSD, LCS, post digestion spike samples, and surrogate spike compounds, in addition to calibration criteria. Accuracy is expressed as percent recovery. Accuracy data were compliant with the QAPP/SOP with the exception of TPH-GRO surrogates and low-level iron CCVs. The DQE resulted in the qualification of the TPH-GRO and iron results as estimated in one sample. Estimated data is usable data and all remaining accuracy data for the other anions, VOCs, TPH-DRO, and metals were within QC limits or did not require qualification. Therefore, the data results indicate method and matrix accuracy is acceptable to achieve project objectives.

12.3 Representativeness

Representativeness for the analytical data is determined through evaluation of the associated blank data and evaluation of appropriate sample handling procedures. All samples were properly stored and preserved in the field and at TestAmerica. Method, trip, and equipment blanks were acceptable. One calibration blank reported low-levels of chloride, however the blank contamination did not result in qualification of the associated sample data. Based on historical results, the impacts to project DQOs were minimal; therefore, the analytical results indicate sample data are representative of the Site conditions.

12.4 Comparability

Comparability addresses the confidence with which one data set can be compared to another. Use of appropriate sampling methods, COC procedures, and EPA-approved analytical methods, as well as adherence to strict QA/QC procedures, provide the basis for uniformity in sample collection and analysis. Analytical data were generated by TestAmerica using standard reporting units of micrograms per liter for VOCs, TPH-GRO, and metals and milligrams per liter for TPH-DRO and anions. In addition, sample collection and analytical method protocols were implemented in accordance with approved, documented procedures. Analytical data are determined to be comparable to previous Site results.

12.5 Completeness

Completeness of the field sampling activities were assessed in terms of the actual number and type of sample results received from the field and laboratory, as compared with the planned number and type of sample results. All samples planned were collected which meets a field completeness of 100%.

Analytical completeness of data is a measure of the number of valid project-specific data results obtained in comparison to the total number of data results projected to achieve project DQOs. Valid data are defined as data that meet the project-specific DQOs. No data were rejected as a result of the data validation; however, some of the results were qualified as estimated. Estimated data is usable data. The completeness goals met the 90 percent goal for field and laboratory data expected for this project.

12.6 Sensitivity

Analytical methods and RLs were implemented in accordance with the QAPP/SOP and EPA promulgated methodologies. Method RLs were achieved for the event except when sample dilutions were required to bring target compounds within the linear range of the instrument calibration. As previously mentioned, the samples within this SDG required dilutions for anions to place the results within the calibration range. These include modified RLs for selected detections; therefore, sensitivity requirements were met for non-diluted constituents.

12.7 Usability Summary

The data generated during the September 2014 sampling event were usable with qualifications with respect to project DQOs. The DQOs for the Enhanced Bioremediation Field Test is to produce data to support design of anaerobic methods for the ST012 remedy if selected.

13.0 REFERENCES

AFCEE, 2005. Quality Assurance Project Plan, Version 4.0.01, May, 2005.

AMEC, August 11, 2014. *Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) (Enhanced Bioremediation Field Test Plan) Operable Unit 2 Site ST012 - Liquid Fuels Storage Area, Former Williams Air Force Base, Mesa, Arizona*.

AMEC, February 23, 2012. *Performance Based Remediation Program Quality Assurance Project Plan (QAPP) and Standard Operating Procedures (SOPs) (QAP/SOP), Former Williams Air Force Base, Mesa, Arizona*.

DoD, 2010. Department of Defense Quality System Manual, Version 4.2 Final, October 2010.

Prepared/Date: DWK 10/23/14
Checked/Date: JAH 10/27/14

Flagged Data Reports

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-59740-1

Client Sample ID: **TB01-090814**

Lab Sample ID: 280-59740-1TB
Client Matrix: Water

Date Sampled: 09/08/2014 0117
Date Received: 09/09/2014 0915

8260B Volatile Organic Compounds (GC/MS)

Analysis Method:	8260B	Analysis Batch:	280-243756	Instrument ID:	VMS_H
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	H4391.D
Dilution:	1.0			Initial Weight/Volume:	20 mL
Analysis Date:	09/18/2014 1104			Final Weight/Volume:	20 mL
Prep Date:	09/18/2014 1104				

DWC
No Flags

Analyte	Result (ug/L)	Qualifier	DL	LOQ
1,2-Dichloroethane	0.40	U	0.13	1.0
Benzene	0.20	U	0.16	1.0
Ethylbenzene	0.20	U	0.16	1.0
Methylene Chloride	0.80	U	0.32	5.0
m-Xylene & p-Xylene	0.80	U	0.34	2.0
Naphthalene	0.80	U	0.22	1.0
o-Xylene	0.40	U	0.19	1.0
Toluene	0.40	U	0.17	1.0
Trichloroethene (TCE)	0.20	U	0.16	1.0
Trichlorofluoromethane	0.80	U	0.29	2.0
Xylenes, Total	1.6	U	0.19	2.0

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	107		70 - 120
4-Bromofluorobenzene (Surr)	105		75 - 120
Dibromofluoromethane (Surr)	108		85 - 115
Toluene-d8 (Surr)	109		85 - 120

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-59740-1

Client Sample ID: **ST012-W11-WG-090814**

Lab Sample ID: 280-59740-2 Date Sampled: 09/08/2014 0117
Client Matrix: Water Date Received: 09/09/2014 0915

8260B Volatile Organic Compounds (GC/MS)

Analysis Method:	8260B	Analysis Batch:	280-243756	Instrument ID:	VMS_H
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	H4402.D
Dilution:	1.0			Initial Weight/Volume:	20 mL
Analysis Date:	09/18/2014 1502			Final Weight/Volume:	20 mL
Prep Date:	09/18/2014 1502				

DWK 10/23/14

Analyte	Result (ug/L)	Qualifier	DL	LOQ
1,2-Dichloroethane	0.40	U	0.13	1.0
Benzene	0.37	F	0.16	1.0
Ethylbenzene	2.4		0.16	1.0
Methylene Chloride	0.80	U	0.32	5.0
m-Xylene & p-Xylene	2.2		0.34	2.0
Naphthalene	0.40	F	0.22	1.0
o-Xylene	0.40	U	0.19	1.0
Toluene	0.40	U	0.17	1.0
Trichloroethene (TCE)	0.20	U	0.16	1.0
Trichlorofluoromethane	0.80	U	0.29	2.0
Xylenes, Total	2.2		0.19	2.0

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	111		70 - 120
4-Bromofluorobenzene (Surr)	106		75 - 120
Dibromofluoromethane (Surr)	113		85 - 115
Toluene-d8 (Surr)	114		85 - 120

Client: AMEC Environment & Infrastructure, Inc.

Job Number: 280-59740-1

Client Sample ID: TB01-090814

Lab Sample ID: 280-59740-1TB
Client Matrix: Water

Date Sampled: 09/08/2014 0117
Date Received: 09/09/2014 0915

8015B_GRO Gasoline Range Organics (GRO)

Analysis Method:	8015B_GRO	Analysis Batch:	280-242714	Instrument ID:	VGC_Q
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	024F2401.D
Dilution:	1.0			Initial Weight/Volume:	5 mL
Analysis Date:	09/10/2014 0006			Final Weight/Volume:	5 mL
Prep Date:	09/10/2014 0006			Injection Volume:	5 mL

DWK
No Flags

Analyte	Result (ug/L)	Qualifier	DL	LOQ
Gasoline Range Organics (GRO)-C6-C10	20	U	10	25

Surrogate	%Rec	Qualifier	Acceptance Limits
a,a,a-Trifluorotoluene	85		82 - 110

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-59740-1

Client Sample ID: **ST012-W11-WG-090814**

Lab Sample ID: 280-59740-2 Date Sampled: 09/08/2014 0117
Client Matrix: Water Date Received: 09/09/2014 0915

8015B_GRO Gasoline Range Organics (GRO)

Analysis Method:	8015B_GRO	Analysis Batch:	280-242714	Instrument ID:	VGC_Q
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	023F2301.D
Dilution:	1.0			Initial Weight/Volume:	5 mL
Analysis Date:	09/09/2014 2341			Final Weight/Volume:	5 mL
Prep Date:	09/09/2014 2341			Injection Volume:	5 mL

DWK 9/23/14

Analyte	Result (ug/L)	Qualifier	DL	LOQ
Gasoline Range Organics (GRO)-C6-C10	73	~~M~~ Q J	10	25

Surrogate	%Rec	Qualifier	Acceptance Limits
a,a,a-Trifluorotoluene	118	Q *	82 - 110

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-59740-1

Client Sample ID: **ST012-W11-WG-090814**

Lab Sample ID: 280-59740-2 Date Sampled: 09/08/2014 0117
Client Matrix: Water Date Received: 09/09/2014 0915

8015B_DRO Diesel Range Organics (DRO) (GC)

Analysis Method:	8015B_DRO	Analysis Batch:	280-243251	Instrument ID:	SGC_U2a
Prep Method:	3510C	Prep Batch:	280-243123	Initial Weight/Volume:	1050 mL
Dilution:	1.0			Final Weight/Volume:	1 mL
Analysis Date:	09/16/2014 0249			Injection Volume:	1 uL
Prep Date:	09/12/2014 2029			Result Type:	PRIMARY

DWK no flags

Analyte	Result (mg/L)	Qualifier	DL	LOQ
Diesel Range Organics [C10-C28]	0.095	U	0.031	0.24

Surrogate	%Rec	Qualifier	Acceptance Limits
o-Terphenyl	76		50 - 115

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-59740-1

Client Sample ID: **ST012-W11-WG-090814**

Lab Sample ID: 280-59740-2 Date Sampled: 09/08/2014 0117
Client Matrix: Water Date Received: 09/09/2014 0915

6010C Metals (ICP)

Analysis Method:	6010C	Analysis Batch:	280-242996	Instrument ID:	MT_025
Prep Method:	3010A	Prep Batch:	280-242657	Lab File ID:	25D091114.asc
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	09/11/2014 1609			Final Weight/Volume:	50 mL
Prep Date:	09/10/2014 1330				

DWK 9/23/14

Analyte	Result (ug/L)	Qualifier	DL	LOQ
Iron	30	U	22	100
Magnesium	140000		11	500
Manganese	67		0.25	10
Potassium	21000		240	3000
Sodium	92000		92	5000

Analysis Method:	6010C	Analysis Batch:	280-243179	Instrument ID:	MT_025
Prep Method:	3010A	Prep Batch:	280-242657	Lab File ID:	25A091214.asc
Dilution:	10			Initial Weight/Volume:	50 mL
Analysis Date:	09/12/2014 1458			Final Weight/Volume:	50 mL
Prep Date:	09/10/2014 1330				

Analyte	Result (ug/L)	Qualifier	DL	LOQ
Calcium	770000		350	10000

General Chemistry

Client Sample ID: ST012-W11-WG-090814

Lab Sample ID: 280-59740-2 Date Sampled: 09/08/2014 0117
Client Matrix: Water Date Received: 09/09/2014 0915

DWK 10/3/14

Analyte	Result	Qual	Units	DL	LOQ	Dil	Method
Bromide	2.5	D	mg/L	0.23	1.0	2.0	9056A
Analysis Batch: 280-242495	Analysis Date: 09/09/2014 2155						
Orthophosphate as P	0.40	U	mg/L	0.37	1.0	2.0	9056A
Analysis Batch: 280-242528	Analysis Date: 09/09/2014 1750						
Chloride	1600	D	mg/L	5.1	60	20	9056A
Analysis Batch: 280-242529	Analysis Date: 09/09/2014 1806						
Sulfate	280	D	mg/L	0.46	10	2.0	9056A
Analysis Batch: 280-242529	Analysis Date: 09/09/2014 1750						

Data Quality Evaluation Checklists

Method Validated: 8260B

Initial Review by: D. Knaub Date: 10/23/14 SDG#: 280-59740-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (METHODS 8260 AND 8270)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C).	QC acceptance criteria published by DoD, if available; otherwise method- specific criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	NA	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	Ok
MDL Study	At initial set-up and subsequently once per 12-month period; otherwise quarterly MDL verification checks shall be performed (see box D-18)	See 40 CFR 136B. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL verification check at higher level and set MDL higher or reconduct MDL study (see box D-18)	NA	Samples cannot be analyzed without a valid MDL.	Ok
Tuning	Prior to calibration and every 12 hours during sample analysis	Refer to method for specific ion criteria.	Retune instrument and verify. Rerun affected samples.	Flagging criteria are not appropriate	Problem must be corrected. No samples may be accepted without a valid tune.	p. 223 – 224 level IV package VMS_H, ICAL/ICV, 9/17/14 VMS_H, CCV 9/18/14 All ok
Breakdown Check (DDT Method 8270C Only)	Daily prior to analysis of samples	Degradation ≤ 20% for DDT	Correct problem then repeat breakdown check	Flagging criteria are not appropriate	No samples shall be run until degradation ≤ 20%. Benzidine and pentachlorophenol should be present at their normal responses and no peak tailing should be observed.	NA

Method Validated: 8260B

Initial Review by: D. Knaub Date: 10/23/14 SDG#: 280-59740-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (METHODS 8260 AND 8270)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Container, Preservation, and Holding Time	All field samples	8260 – 40 ml VOA vial HCl to pH < 2, Cool to 4°C 14 days to analysis 8270 – 1 L Amber glass, Cool to 4°C 7 days to extraction 40 days to analysis	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collection date: 9/08/14 Analysis date: 9/18/14, Temp 1.9 °C
Minimum Five-Point Initial Calibration For All Analytes (ICAL)	Initial calibration prior to sample analysis	Average response factor (RF) for SPCCs: VOCs - 0.30 for Chlorobenzene and 1,1,2,2-tetrachlorolethane. a 0.1 for chloromethane, bromoform, and 1,1-dicbloroethane. SVOCs - a 0.050. RSD for RFs for CCCs: The CCCs are vinyl chloride, 1,1-dichlorethene, chloroform, 1,2-dichloropropane, toluene, and ethylbenzene. VOCs and SVOCs - 30% and one option below; **Option 1**: RSD for each analyte ≤ 15% **Option 2**: linear least squares regression r a 0.995 **Option 3**: non-linear regression - coefficient of determination (COD) e a 0.99 (6 points shall be used for second order, 7 points shall be used for third order)	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.	p. 237 VMS_H, 9/17/14 All OK p. 284 VMS_H, 9/17/14 (short list) All OK

Method Validated: 8260B

Initial Review by: D. Knaub Date: 10/23/14 SDG#: 280-59740-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (METHODS 8260 AND 8270)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 25% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	VMS_H ICV not included but run on 9/17/14 12:53 and 15:46 –see page 346.
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL	Position shall be set using the midpoint standard of the initial calibration curve.	NA			All OK
Evaluation of Relative Retention Times (RRT)	With each sample	RRT of each target analyte in each calibration standard within ± 0.06 RRT units.	Correct problem, then rerun ICAL.			All ok
Calibration Verification (CV)	Daily, before sample analysis, and every 12 hours of analysis time	Average RF for SPCCs: VOCs 0.30 for Chlorobenzene and 1,1,2,2-tetrachlorolethane, 0.1 for chloromethane, bromoform, and 1,1-dichloroethane. SVOCs 0.050. 2. %Difference/Drift for CCCs: VOCs and SVOCs ≤20%D (Note: D = difference when using RFs or drift when using least squares regression or non-linear calibration.)	Correct problem, then rerun CV. If that fails, repeat initial calibration. See section 5.5.10 and DoD clarification box 55.	Apply Q-flag if no sample material remains and analyte exceeds criteria.	NA	p. 309, VMS_H ICV/CCV 280-243756/2 (9/18/14) p. 325 VMS_H CCV (short list) 280-243756/3 (9/18/14) All COIs OK
Internal Standards Verification	In all field samples and standards	Retention time ± 30 seconds from retention time of the midpoint standard in the ICAL	Inspect mass spectrometer and GC for malfunctions. Reanalysis of samples	If corrective action fails in field samples, apply Q-flag to analytes associated	Flagging criteria are not appropriate.	p. 225 -226 ICIS 280-243577/22 All ok

ORGANIC ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (METHODS 8260 AND 8270)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
		EICP area within - 50% to + 100% of ICAL midpoint standard	analyzed while system was malfunctioning is mandatory.	with the non-compliant IS. Flagging criteria are not appropriate for failed standards.		
Method Blank	One per preparatory batch	No analytes detected >½ RL. For common laboratory contaminants, no analytes detected > RL.	Correct problem, then see criteria in box D-5. If required, reprep and reanalyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch.		p.44 MB 280-243756/6 All ND
LCS Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	QC acceptance criteria specified by DoD, if available; see box D-7 and Appendix DoD-D.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. (See full explanation in Appendix DoDID.	If corrective action fails, applyIQ-flag to specific analyte(s) in all samples in the associated preparatory batch.		p.45 LCS 280-24376/4 All OK
MS	One MS per preparatory batch per matrix (see box D- 15)	For matrix evaluation, use QC acceptance criteria specified by DoD for LCS.	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	Lab: For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error	No MS/MSD submitted for method 8260B

ORGANIC ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (METHODS 8260 AND 8270)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
MSD or Sample Duplicate	One per preparatory batch per matrix	RPD ≤ 30% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	Lab: For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	NA -See above
Surrogate Spike (Analytes Identified in Appendix DoD-D)	All field and QC samples	QC acceptance criteria for LCS published by DoD, if available; otherwise method- specified criteria or laboratory's own in-house criteria.	For QC and field samples, correct problem, then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available.	For the specific analyte(s) in all field samples collected from the same site matrix as the parent, apply J-flag if acceptance criteria are not met. For QC samples, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.		p. 41 All OK.
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤30%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		None in this SDG
Results Reported Between MDL and LOQ	NA	NA	NA	Apply J-flag to all results between MDL and LOQ. Validator flags: If using AFCEE; Apply "F" flag		Samples qualified as estimated and AFCEE flagged "F" unless overridden by flags for other criteria

Method Validated: 8260B

Initial Review by: D. Knaub Date: 10/23/14
Senior Review by: J. Hartness Date: 10/27/14

SDG#: 280-59740-1
Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (METHODS 8260 AND 8270)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
QC Blanks (Trip Blanks, Equipment Blanks, and Field Blanks)	Trip Blank – one per cooler containing samples for VOCs Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B"		TB01-090814 All ND

Method Validated: 8015B (TPH-GRO) Initial Review by: D. Knaub Date: 10/23/14 SDG#:280-59740-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	ok
Method Detection Limit (MDL) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly MDL verification checks shall be performed (see box 0-18)	See 40 CFR 1368. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL verification check at higher level and set MDL higher or reconduct MDL study (see box D-18).	NA	Samples cannot be analyzed without a valid MDL.	ok
Retention Time (RT) Window Width Calculated for Each Analyte and Surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 72-hour study.	NA	NA		
Breakdown Check (Endrin/ DDT Method 8081 Only)	Daily prior to analysis of samples	Degradation ≤ 15% for both Endrin and DDT.	Correct problem then repeat breakdown check.	Flagging criteria are not appropriate	No samples shall be run until degradation ≤ 15%.	NA TPH-GRO

Method Validated: 8015B (TPH-GRO) Initial Review by: D. Knaub Date: 10/23/14 SDG#:280-59740-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Container, Preservation, and Holding Time	All field samples	GRO- Water: 40 ml VOA vial; HCl to pH < 2, Cool to 6°C Soil: (low-level) 5 g in 40 ml VOA w/H_2O or sodium bisulfate; Cool to 6°C (high-level) 5 g in 40 ml VOA w/methanol, Cool to 6°C, or EnCore® or equivalent (48 hrs to preservation) 14 days to analysis DRO – Water: 1 L Amber glass, Cool to 6°C Soil: 4 oz amber glass jar, Cool to 6°C Water: 7 days to extraction Soil: 14 days to extraction 40 days to analysis	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collected: 9/08/14 Temp=1.9°C (CoC) Narrative : 2.6°C Analyzed: 9/09/14, 9/10/14 ***ok***

Method Validated: 8015B (TPH-GRO) Initial Review by: D. Knaub Date: 10/23/14 SDG#:280-59740-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Minimum Five-Point Initial Calibration For All Analytes (ICAL)	Initial calibration prior to sample analysis	One of the options below (except for Method 8082, which may only use Option 1 or 2): Option 1: RSD for each analyte ≤ 20% Option 2: linear least squares regression: r 2 ≥0.995 Option 3: non-linear regression: coefficient of determination (COD) r2 ≥0.99 (6 points shall be used for second order, 7 points shall be used for third order)	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed. For PCB analysis, a mixture of Aroclors 1016 and 1260 is normally used to establish detector calibration linearity, unless project-specific data suggest the presence of another Aroclor (e.g., 1232). In addition, a mid-level or lower standard for each of the remaining Aroclors is analyzed for pattern recognition and response factor.	p. 376 Inst VGC_Q 3/12/14 OK
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 20% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	p. 404 ICV 280-216544/11 3/12/14 Inst VGC_Q
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL and at the beginning of the analytical shift	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift.	NA	NA		p. 375 ICAL

Method Validated: 8015B (TPH-GRO) Initial Review by: D. Knaub Date: 10/23/14 SDG#:280-59740-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time Window Verification for Each Analyte and Surrogate	Each calibration verification standard	Analyte within established window	Correct problem, then reanalyze all samples analyzed since the last acceptable retention time check. If they fail, redo ICAL and reset retention time window,	Flagging criteria are not appropriate for initial verification. For CCV, apply a Q-flag to all results for analytes outside the established window.	No samples shall be run without a verified retention time window at the initial verification. For method 8015, check state methods for use of modified retention time markers with gasoline range organics (GRO) or diesel range organics (DRO).	p. 405 ICV p. 411, 418, 425 CCVs
Calibration Verification (Initial [ICV] and Continuing [CCV])	ICV: Daily, before sample analysis CCV: After every 10 field samples and at the end of the analysis sequence	All analytes within ± 20% of expected value from the ICAL	ICV: Correct problem, rerun ICV. If that fails, repeat initial calibration. See section 5.5.10 and box 55. CCV: Correct problem then repeat CCV and reanalyze all samples since last successful calibration verification.	ICV: Flagging criteria are not appropriate. CCV: Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification, if . reanalysis is not possible.	If %D for an individual analyte is > 20%, no samples may be analyzed until the problem has been corrected.	p. 404 ICVRT 280-216544/11 3/12/14 Inst VGC_Q OK p. 410 CCV 280-242714/4 9/09/14 Inst VGC_Q OK p. 417 CCV 280-242714/19 9/09/14 Inst VGC_Q OK p. 424 CCV 280-242714/26 9/10/14 Inst VGC_Q OK
Method Blank	One per preparatory batch	No analytes detected > ½RL. For common laboratory contaminants, no analytes detected > RL.	Correct problem, then see criteria in box 0-5; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch		p. 46 MB 280-242714/5 ND

Method Validated: 8015B (TPH-GRO) Initial Review by: D. Knaub Date: 10/23/14 SDG#:280-59740-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Laboratory Control Sample (LCS) Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	QC acceptance criteria specified by DoD, if available; see box D-7 and Appendix DoD-D .	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix DoD D)	If corrective action fails apply J-flag to specific analyte(s) in all samples in the associated preparatory batch		p. 46, LCS/LCSD 280-24214/6,7 GRO = 83, 85 RPD = 2
Matrix Spike (MS)	One MS per preparatory batch per matrix (see box ID- 11)	For matrix evaluation, use QC acceptance criteria specified by DoD for LCS.	Examine the project-specific DQOs. Contact the client as to additional measures to be taken,	Lab: For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	No MS/MSD submitted with this SDG
Matrix Spike Duplicate (MSD) or Sample Duplicate	One per preparatory batch per matrix	RPD ≤30% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	Lab: For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	No MSD performed with this SDG
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤30%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		None in this SDG

Method Validated: 8015B (TPH-GRO) Initial Review by: D. Knaub Date: 10/23/14 SDG#:280-59740-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Surrogate Spike (Analytes Identified in Appendix DoD-D)	All field and QC samples	QC acceptance criteria for LCS specified by DoD, if available; otherwise method- specified criteria or laboratory's own in-house criteria	For QC and field samples, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	For the specific analyte(s) in all field samples collected from the same site matrix as the parent, apply J-flag if acceptance criteria are not met. For QC samples, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	Alternative surrogates are recommended when there is obvious chromatographic interference.	p. 42 ST012-W11-WG-090814= 118% ***Flag assoc. result "J"***
Confirmation of Positive Results (Second Column or Second Detector)	All positive results must be confirmed (in Method 8081A exclude toxaphene and technical chlordane, in Method 8015B exclude GRO, DRO, and residual range organics (RRO)).	Calibration and QC criteria same as for initial or primary column analysis. Results between primary and second column RPD ≤ 40%.	NA	Apply J-flag if RFD > 40% or Q-flag if sample is not confirmed. Discuss in the case narrative.	Report the higher of two confirmed results unless overlapping peaks are causing erroneously high results, then report the non- affected result and document in the case narrative.	NA
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between LOD and LOQ. Validator flags: If using AFCEE; Apply "F" flag		No targets detected between LOD and LOQ

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
QC Blanks (Trip Blanks, Equipment Blanks, and Field Blanks)	Trip Blank – one per cooler containing samples for volatile parameters Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B"		TB01-090814 ND for GRO

Method Validated: 8015B (TPH-DRO) Initial Review by: D. Knaub Date: 10/23/14 SDG#:280-59740-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	ok
Method Detection Limit (MDL) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly MDL verification checks shall be performed (see box 0-18)	See 40 CFR 1368. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL verification check at higher level and set MDL higher or reconduct MDL study (see box D-18).	NA	Samples cannot be analyzed without a valid MDL.	ok
Retention Time (RT) Window Width Calculated for Each Analyte and Surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 72-hour study.	NA	NA		
Breakdown Check (Endrin/ DDT Method 8081 Only)	Daily prior to analysis of samples	Degradation ≤ 15% for both Endrin and DDT.	Correct problem then repeat breakdown check.	Flagging criteria are not appropriate	No samples shall be run until degradation ≤ 15%.	NA TPH-DRO

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Container, Preservation, and Holding Time	All field samples	GRO- Water: 40 ml VOA vial; HCl to pH < 2, Cool to 6°C Soil: (low-level) 5 g in 40 ml VOA w/H_2O or sodium bisulfate; Cool to 6°C (high-level) 5 g in 40 ml VOA w/methanol, Cool to 6°C, or EnCore® or equivalent (48 hrs to preservation) 14 days to analysis DRO – Water: 1 L Amber glass, Cool to 6°C Soil: 4 oz amber glass jar, Cool to 6°C Water: 7 days to extraction Soil: 14 days to extraction 40 days to analysis	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collected: 9/08/14 Temp= 1.9 °C (CoC) Narrative: 2.6°C Extracted; 9/12/14 Analyzed: 9/16/14 ***ok***

Method Validated: 8015B (TPH-DRO) Initial Review by: D. Knaub Date: 10/23/14 SDG#:280-59740-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Minimum Five-Point Initial Calibration For All Analytes (ICAL)	Initial calibration prior to sample analysis	One of the options below (except for Method 8082, which may only use Option 1 or 2): Option 1: RSD for each analyte ≤ 20% Option 2: linear least squares regression: r 2 ≥0.995 Option 3: non-linear regression: coefficient of determination (COD) r2 ≥0.99 (6 points shall be used for second order, 7 points shall be used for third order)	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed. For PCB analysis, a mixture of Aroclors 1016 and 1260 is normally used to establish detector calibration linearity, unless project-specific data suggest the presence of another Aroclor (e.g., 1232). In addition, a mid-level or lower standard for each of the remaining Aroclors is analyzed for pattern recognition and response factor.	p. 460 Inst SGC_U 2a 3/26/14 OK
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 20% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	p. 501 ICV 280-218430/11 3/26/14 Inst SGC_U2a
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL and at the beginning of the analytical shift	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift.	NA	NA		p. 459 ICAL

Method Validated: 8015B (TPH-DRO) Initial Review by: D. Knaub Date: 10/23/14 SDG#:280-59740-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time Window Verification for Each Analyte and Surrogate	Each calibration verification standard	Analyte within established window	Correct problem, then reanalyze all samples analyzed since the last acceptable retention time check. If they fail, redo ICAL and reset retention time window,	Flagging criteria are not appropriate for initial verification. For CCV, apply a Q-flag to all results for analytes outside the established window.	No samples shall be run without a verified retention time window at the initial verification. For method 8015, check state methods for use of modified retention time markers with gasoline range organics (GRO) or diesel range organics (DRO).	p. 502 ICV p. 510 CCV p. 517 CCV p. 524 CCV p. 531 CCV
Calibration Verification (Initial [ICV] and Continuing [CCV])	ICV: Daily, before sample analysis CCV: After every 10 field samples and at the end of the analysis sequence	All analytes within ± 20% of expected value from the ICAL	ICV: Correct problem, rerun ICV. If that fails, repeat initial calibration. See section 5.5.10 and box 55. CCV: Correct problem then repeat CCV and reanalyze all samples since last successful calibration verification.	ICV: Flagging criteria are not appropriate. CCV: Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification, if . reanalysis is not possible.	If %D for an individual analyte is > 20%, no samples may be analyzed until the problem has been corrected.	p. 501 ICV 280-218430/11 3/26/14 Inst SGC_U2a p. 509 CCV 280-243251/3 9/15/14 Inst SGC_U2a p. 516 CCV 280-243251/25 9/15/14 Inst SGC_U2a p. 523 CCV 280-243251/37 9/16/14 Inst SGC_U2a p. 530 CCV 280-243251/43 9/16/14 Inst SGC_U2a

Method Validated: 8015B (TPH-DRO) Initial Review by: D. Knaub Date: 10/23/14 SDG#:280-59740-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Method Blank	One per preparatory batch	No analytes detected > ½RL. For common laboratory contaminants, no analytes detected > RL.	Correct problem, then see criteria in box 0-5; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch		p. 48 MB 280-243123/1-A DRO=ND
Laboratory Control Sample (LCS) Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	QC acceptance criteria specified by DoD, if available; see box D-7 and Appendix DoD-D .	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix DoD D)	If corrective action fails apply J-flag to specific analyte(s) in all samples in the associated preparatory batch		p. 48 LCS/LCSD 280-242123/ 2-A,3-A DRO = 83, 77 RPD = 7
Matrix Spike (MS)	One MS per preparatory batch per matrix (see box ID- 11)	For matrix evaluation, use QC acceptance criteria specified by DoD for LCS.	Examine the project-specific DQOs. Contact the client as to additional measures to be taken,	Lab: For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	No MS/MSD submitted with this SDG
Matrix Spike Duplicate (MSD) or Sample Duplicate	One per preparatory batch per matrix	RPD ≤30% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	Lab: For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	No MSD or lab dup performed with this SDG

Method Validated: 8015B (TPH-DRO) Initial Review by: D. Knaub Date: 10/23/14 SDG#:280-59740-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤30%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		None in this SDG
Surrogate Spike (Analytes Identified in Appendix DoD-D)	All field and QC samples	QC acceptance criteria for LCS specified by DoD, if available; otherwise method- specified criteria or laboratory's own in-house criteria	For QC and field samples, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	For the specific analyte(s) in all field samples collected from the same site matrix as the parent, apply J-flag if acceptance criteria are not met. For QC samples, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	Alternative surrogates are recommended when there is obvious chromatographic interference.	p. 43 **All ok**
Confirmation of Positive Results (Second Column or Second Detector)	All positive results must be confirmed (in Method 8081A exclude toxaphene and technical chlordane, in Method 8015B exclude GRO, DRO, and residual range organics (RRO)).	Calibration and QC criteria same as for initial or primary column analysis. Results between primary and second column RPD ≤ 40%.	NA	Apply J-flag if RFD > 40% or Q-flag if sample is not confirmed. Discuss in the case narrative.	Report the higher of two confirmed results unless overlapping peaks are causing erroneously high results, then report the non- affected result and document in the case narrative.	NA

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between LOD and LOQ. Validator flags: If using AFCEE; Apply "F" flag		No targets detected between LOD and LOQ
QC Blanks (Trip Blanks, Equipment Blanks, and Field Blanks)	Trip Blank – one per cooler containing samples for volatile parameters Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B"		No EB

Method Validated: 6010

Initial Review by: D. Knaub Date: 10/23/14 SDG#:280-59740-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETRY (METHOD 6010)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	Ok
Instrument Detection Limit (IDL) Study	At initial set-up and after significant change in instrument type, personnel, test method, or sample matrix	IDL shall be ≤ Limit of Detection (LOD)	NA	NA		p. 577 6/11/13
Container, Preservation, and Holding Time	All field samples	Water: 500 ml Poly, HNO_3 to pH < 2, Cool to 6°C, Soil: 4 oz glass or poly jar, Cool to 6°C 180 days to analysis	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collection date: 9/08/14 Prep; 9/10/14 Analysis date: 9/11/14, 9/12/14 Temp:1.9 °C (CoC) Narrative: 2.6°C
Initial calibration (ICAL) for all analytes (minimum one high standard and a calibration blank)	Daily ICAL prior to sample analysis	If more than one calibration standard is used, r ≥ 0.995.	Correct problem then repeat ICAL.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.	p. 587 run log ICIS analyzed 9/11/2014 09:57 IC analyzed 9/11/2014 09:59 and 10:02

Method Validated: 6010 | Initial Review by: D. Knaub | Date: 10/23/14 | SDG#:280-59740-1
Senior Review by: J. Hartness | Date: 10/27/14 | Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETRY (METHOD 6010)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Second Source Calibration Verification (ICV)	Once after each ICAL, prior to beginning sample run	Value of second source for all analytes within ± 10% of true value	Correct problem and verify second source standard. Rerun ICV. If that fails, correct problem and repeat ICAL.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	p. 558 ICVH 280-242996/6 9/11/2014 All OK p. 559 ICV 280-242996/7 9/11/2014 All OK p. 560 ICVL 280-242996/8 9/11/2014 Ca = 85% Fe = 87% *Ca not reported from this run, Fe results qualified as estimated and flagged "UJ"* p. 562 ICV 280-243179/11 9/12/14 All OK p. 563 ICVL 280-243179/14 9/12/14 All OK
Continuing Calibration Verification (CCV)	After every 10 field samples and at the end of the analysis sequence	All analytes within ± 10% of true value	Correct problem, rerun CCV. If that fails, then repeat ICAL. Reanalyze all samples since last successful calibration verification	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q-flag to all results for the specific analyte(s) of interest in all samples since the last acceptable CCV. Validator flags: If using AFCEE; Apply "J" flag only if reanalysis cannot be performed	Problem must be corrected. Results may not be reported without a valid CCV. Flagging is only appropriate in cases where the samples cannot be reanalyzed.	p. 558CCVH 280-242996/22,33 9/11/14 All OK p. 559 CCV 280-242996/23, 34, 36 9/10/14 All OK p. 560 CCVL 280-242996/25, 36 9/11/14 Ca = 84, 89% Fe = 88, 97% *Ca not reported from this run, Fe results previously qualified as estimated and flagged "UJ"* p. 561 CCVH 280-243179/42, 51 9/12/14 All OK p. 562 CCV 280-243179/43, 52 9/12/14 All OK p. 563 CCV 280-243179/45, 54 9/12/15 All OK

Method Validated: 6010 | Initial Review by: D. Knaub | Date: 10/23/14 | SDG#:280-59740-1
Senior Review by: J. Hartness | Date: 10/27/14 | Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETRY (METHOD 6010)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Low-level calibration check standard	Daily, after one-point ICAL	Within ± 20% of true value	Correct problem, then reanalyze	Flagging criteria are not appropriate.	No samples may be analyzed without a valid low-level calibration check standard. Low-level calibration check standard should be less than or equal to the reporting limit.	p. 564 ***All OK***
Linear dynamic range or high-level check standard	Every 6 months	Within ±10% of expected value	NA	NA		p. 585 7/21/14
Method Blank	One per preparatory batch	No analytes detected > ½ RL and greater than 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL (see Box D-1).	Correct problem, then see criteria in box D-1; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch	Problem must be corrected. Results may not be reported without a valid method blank. Flagging is only appropriate in cases where samples cannot be reanalyzed.	p. 50 MB-280-242657/1-A All ND
Calibration blank	Before beginning a sample run, after every 10 samples, and at end of the analysis sequence	No analytes detected > LOD	Correct problem. Reprep and reanalyze calibration blank. All samples following the last acceptable calibration blank must be reanalyzed	Apply B-flag to all results for specific analyte(s) in all samples associated with the blank.		p. 565 9/11/14 ICB/CCBs 280-242996/11,24,35 ND p. 566 9/12/14 ICB/CCBs 280-243179/17, 44, 53 All ND

Method Validated: 6010 | Initial Review by: D. Knaub | Date: 10/23/14 | SDG#:280-59740-1
Senior Review by: J. Hartness | Date: 10/27/14 | Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETRY (METHOD 6010)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Interference check solutions (ICS-A and ICS-AB)	At the beginning of an analytical run and every 12 hours	ICS-A: Absolute value of concentration for all non-spiked analytes < LOD (unless they are a verified trace impurity from one of the spiked analytes) ICS-AB: Within ±20% of expected value	Terminate analysis, locate and correct problem, reanalyze ICS, reanalyze all samples.	If corrective action fails, apply Q-flag to all results for specific analyte(s) in all samples associated with the ICS. Validator flags: If using AFCEE; Apply "M" flag		p. 568 9/11/14 ICSA - ICS-A Mn >LOD *No qualification- vendor verified trace impurities* p. 569 9/11/14 ICSAB All OK p. 570 9/12/14 ICSA All OK p. 571 9/12/14 ICS-AB All OK
Laboratory Control Sample (LCS) Containing All Analytes to be Reported	One per preparatory batch	QC acceptance criteria specified by DoD, if available; see box D-3 and Appendix G.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix G)	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch Validator flags: If using AFCEE; Apply "J" flag	Problem must be corrected. Results may not be reported without a valid LCS. Flagging is only appropriate in cases where the samples cannot be reanalyzed.	p. 50 LCS-280-242657/2-A 9/11/14 All OK
Matrix Spike (MS)	One per preparatory batch per matrix (see box D-7)	For matrix evaluation, use QC acceptance criteria specified by DoD for LCS.	Examine the project-specific DQOs. If the matrix spike falls outside of DoD criteria, additional quality control test (dilution test and post-digestion spike addition) are required to evaluate matrix effects.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	p. 52 ST012-W11-WG-090814 All ok
Matrix Spike Duplicate (MSD)	One per preparatory batch per matrix (see Box D-7)	MSD: For matrix evaluation use QC acceptance criteria specified by DoD for LCS MSD RPD < 20%	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	p. 52 ST012-W11-WG-090814 RPDs All ok

Method Validated: 6010 | Initial Review by: D. Knaub | Date: 10/23/14 | SDG#:280-59740-1
Senior Review by: J. Hartness | Date: 10/27/14 | Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETRY (METHOD 6010)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Dilution test	Once per preparatory batch	Five-fold dilution must agree within ± 10% of the original measurement	Perform post-digestion spike addition.	Flagging criteria are not appropriate.	Only applicable for samples with concentrations > 50 x LOQ.	p. 54 ST012-W11-WG-090814 All OK
Post digestion spike addition	When dilution test fails or analyte concentration for all samples < 50 x LOQ	Recovery within 75-125% of (see Table B-1)	Run all associated samples in the preparatory batch by method of standard additions (MSA) or see flagging criteria.	For specific analyte(s) in the parent sample, apply J-flag of acceptance criteria are not met.	Spike addition should produce a concentration of 10 - 100 x LOQ	p. 51 Mg = 67% ***No qualification: sample results greater than 4x spike amount***
Method of standard additions (MSA)	When matrix interference is suspected	NA	NA	NA	Document use of MSA in the case narrative.	NA
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD 20%	Qualify samples	For the specific analyte(s) in the parent & dup samples, apply J-flag if acceptance criteria are not met.		None in this SDG
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between DL and LOQ. Validator flags: If using AFCEE; Apply "F" flag		Results reported between MDL and RL flagged "F" for AFCEE.
QC Blanks (Equipment Blanks, and Field Blanks)	Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value are qualified as estimated and flagged "B".		No EB

Method Validated: 9056A

Initial Review by: D. Knaub Date: 10/23/14

Senior Review by: J. Hartness Date: 10/27/14

SDG#: 280-59740-1

Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	ok
Limit of Detection Determination and Verification (LOD) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOD verification checks shall be performed (see box D-13)	See 40 CFR 1368. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL / LOD verification check at higher level and set MDL higher or reconduct MDL study (see box D-13).	NA	Samples cannot be analyzed without a valid MDL.	p. 1131, 1133 6/16/2013
Limit of Quantitation Establishment and Verification (LOQ) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOQ verification checks shall be performed (see box D-14)	Within calibration range including low standard; within method precision and accuracy.	Re-run LOQ	NA	Samples cannot be analyzed without a valid LOQ	MRL check: Level 4 Package Pg. 1130 (9/09/14) = All OK

Method Validated: 9056A

Initial Review by: D. Knaub Date: 10/23/14

Senior Review by: J. Hartness Date: 10/27/14

SDG#: 280-59740-1

Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time (RT) Window Width Calculated for Each Analyte and Surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 24-hour study.	NA	NA		OK
Container, Preservation, and Holding Time	All field samples	500 ml poly, Cool to 4°C Nitrate – 48 hours Nitrite, sulfate, chloride – 28 days	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collected: 9/08/14 Temp: 1.9°C (Coc) Narrative: 2.6°C Analyzed: 9/09/14
ICAL for All Analytes (Minimum Three Standards and One Calibration Blank)	Initial calibration prior to sample analysis	R ≥ 0.995	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.	p. 1138, 1162 Level IV package 8/27/14 6 levels Inst. IC11 OK
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 10% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	p. 1177, 1124 Level 4 Package OK
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL and at the beginning of the analytical shift	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift.	NA	NA		OK

Method Validated: 9056A

Initial Review by: D. Knaub Date: 10/23/14

Senior Review by: J. Hartness Date: 10/27/14

SDG#: 280-59740-1

Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Midrange Continuing Calibration Verification (CCV)	After every 10 field samples and at end of the analysis sequence.	All analytes within established retention time windows and within ± 10% of true value	Correct problem then repeat CCV. If that fails, then repeat ICAL. Reanalyze all samples since last successful calibration verification.	Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification, if . reanalysis is not possible.	No samples may be analyzed until the problem has been corrected.	p. 1124 Level IV Package 9/09/14 All OK
Method Blank	One per preparatory batch	No analytes detected > ½ RL. See box D-1.	Correct problem, then see criteria in box D-1; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	Lab: Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch. Validator; Apply "B" flag if result is less than 5x method blank.		p. 55 MB 280-242495/6 All ND p. 57 MB 280-242528/19 ortho-P = ND p. 59 MB 280-242529/19 All ND p. 1124: CCBs ending CCB (9/09/14 22:55) CI = 0.634 *No assoc. results < 5x blank, no flags necessary*

Method Validated: 9056A

Initial Review by: D. Knaub Date: 10/23/14

Senior Review by: J. Hartness Date: 10/27/14

SDG#: 280-59740-1

Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Laboratory Control Sample (LCS) Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	Use laboratory in-house LCS acceptance criteria (not to exceed 20%).See Box D-3.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix G)	If corrective action fails apply J-flag to specific analyte(s) in all samples in the associated preparatory batch		p. 56 Br = 98, 98 Cl = 98, 98 SO4 = 95, 95 p. 57 ortho-P = 103, 100 p. 59 Cl = 100, 100 SO4 = 100, 100 All OK
Matrix Spike (MS)	One MS per preparatory batch per matrix (see box D- 7)	For matrix evaluation, use laboratory in-house LCS acceptance criteria (not to exceed 20%).	Examine the project-specific 000s. Contact the client as to additional measures to be taken,	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	None from this SDG
Matrix Spike Duplicate (MSD) or Sample Duplicate	One per preparatory batch per matrix	RPD ≤15% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	NA
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤10%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		No field dups in this SDG

Method Validated: 9056A

Initial Review by: D. Knaub
Senior Review by: J. Hartness

Date: 10/23/14
Date: 10/27/14

SDG#: 280-59740-1
Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between LOD and LOQ. Validator flags: If using AFCEE; Apply "F" flag		No detections between LOD and LOQ
QC Blanks (Equipment Blanks and Field Blanks)	Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B".		No EB

Data Evaluation Narrative
AMEC Project: Former Williams AFB
AMEC Project Number: 9101110001.5300.5301
Site: ST012 – Enhanced Bioremediation Field Test
Sampling Event: September 2014
Matrix: Groundwater

SDG: 280-59873-1

1.0 INTRODUCTION

A data quality evaluation (DQE) was performed on the data reported for the Enhanced Bioremediation field test conducted at Site ST012 in September 2014, at the former Williams Air Force Base (AFB), Mesa, Arizona. The following sections provide summary discussions of the required data qualifications for each site and analytical methods for samples collected at the former WAFB. Data validation was conducted on 100% of the primary samples and field quality control samples (trip blanks, rinsate blanks, sample duplicates, and matrix spike/matrix spike duplicate [MS/MSD] samples). A Level III (Step IIB) data validation was performed using supplemental checklists to review the following quality control elements: laboratory case narrative, sample documentation, chain-of-custody, holding time protocols, method-specific calibration information, mass tunes, method blank results, laboratory control sample (LCS) results, surrogate recoveries (where applicable), MS/MSD recoveries and relative percent differences (RPDs), field duplicate RPDs, trip and equipment/rinsate blanks, method-specific QC elements (such as interelement check standards (ICS), serial dilutions, post digestion spikes (PDS), column breakdown, etc.), method sensitivity, and completeness. The Level III DQE checklists are attached to this narrative.

Data were reviewed using precision and accuracy control limits presented in The Department of Defense (DoD) Quality Systems Manual (QSM) Version 4.2 (DoD, 2010). DQE data qualifications were applied if necessary in accordance with procedures in Air Force Center for Environmental Excellence (AFCEE) Quality Assurance Project Plan (QAPP), Version 4.0.01 (AFCEE, 2005), the method, and professional judgment using the following qualifiers:

J = The reported concentration is considered an estimated value due to discrepancies in meeting certain analyte-specific quality control criteria.
F = The reported concentration is between the limit of quantitation/reporting limit (LOQ/RL) and method detection limit (MDL) and is considered an estimated value
UJ = The target compound was not detected and the reporting limit is considered imprecise due to discrepancies in meeting certain analyte-specific quality control criteria.
B = The result may be biased high or a false positive based on blank data.
M = The reported concentration is estimated due to matrix effects.
R = The data are considered unusable due to discrepancies in meeting certain quality control criteria and may not be used in decision making.

2.0 DELIVERABLES

The data packages as submitted to AMEC Environment and Infrastructure, Inc. (AMEC) are complete as stipulated in the Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) for Site ST012 Enhanced Bioremediation Field Test Plan (AMEC, 2014), and the applicable guidelines described in the former Williams AFB Performance Based Remediation Program QAPP and standard operating procedures (SOPs) (collectively referred to as the QAPP/SOP [AMEC, 2012]) for U.S. States Environmental Protection Agency (EPA) Methods SW8260B, SW8015B, SW9056A, and SW6010C.

3.0 SAMPLE INTEGRITY

Samples within this sample delivery group (SDG) collected from ST012 were submitted to TestAmerica Laboratories (TAL) in Denver, Colorado for select volatile organic compounds (VOCs) analysis by USEPA Method SW8260B, total petroleum hydrocarbons-gasoline range organics (TPH-GRO) and diesel range organics (TPH-DRO) by Method SW8015B, anions by Method SW9056A and select metals by Method SW6010C.

Based on the information provided on the cooler receipt forms, samples arrived at the laboratory within the recommended temperature and preservation requirements. Completed Chain-of-Custody (COC) documents are included in the data package.

4.0 SAMPLE IDENTIFICATION

This SDG contains the following water and quality control (QC) samples:

Site: ST012	QC Samples
ST012-W30-WG-091014	TB01-091014

These samples were collected on 10 September 2014.

5.0 SAMPLE QUALIFICATION

Only those components that required qualification of the data are presented in this narrative. All Level III components were within the DoD QSM QC limits, with the following exceptions:

- Constituents were present in the associated blanks and flagged “B” (no flags applied).
- Surrogate recoveries were outside QC limits (no flags applied).
- Metals were detected in the Interference Check Solution A (ICSA) (no qualification required).
- PDS recoveries were outside QC limits for two metals (no flags applied).

6.0 VOCS (SW8260B)

Samples collected from site ST012 were submitted for VOCs by EPA Method SW8260B and analyzed for site-specific VOC compounds of interest (COIs).

A Level III validation was performed on this method and only those components that exceeded the QAPP/SOP criteria are presented below. Each of the Level III components was within the QAPP/SOP QC criteria.

6.1 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of VOCs by USEPA Method SW 8260B except where dilutions were required to place the constituent within the calibration range. Dilutions were required on samples from this SDG. The laboratory indicated a dilution with a "D" qualifier which was subsequently removed during the validation process.

Any result reported between the LOQ and MDL is considered a quantitative estimate. No results in this SDG were reported between the RL and MDL.

7.0 TPH-GRO (8015B)

Samples collected from Site ST012 were submitted for TPH-GRO analysis by EPA Method SW8015B. A Level III validation was performed on this method and only those components that exceeded the program document QAPP/SOP criteria are presented below. Qualification was required for the following:

- Surrogate recoveries were outside QC limits (no flags applied).

7.1 Surrogate Recoveries

Surrogate a,a,a-trifluorotoluene recovered above the QC limits in sample ST012-W30-WG-091014. No qualification is required if the samples were diluted or the surrogate recoveries were high and the sample results were non-detect.

Action: No qualification was necessary because the sample was analyzed at a dilution.

7.2 Limits of Quantitation

The LOQ as specified in the QAPP/SOP (AMEC, 2012) was met for samples submitted for the analysis of TPH-GRO by EPA Method SW8015B except where dilutions were required to place the constituent within the calibration range. Dilutions were required on samples from this SDG. The laboratory indicated a dilution with a "D" qualifier which was subsequently removed during the validation process.

8.0 TPH-DRO (8015B)

Samples collected from Site ST012 were submitted for TPH-DRO analysis by EPA Method SW8015B. A Level III validation was performed on this method and no components exceeded the program document QAPP/SOP criteria. It should be noted that the laboratory placed an "M" qualifier on any result that was manually integrated. The "M" qualifier was subsequently removed during the data validation process.

8.1 Limits of Quantitation

The LOQ as specified in the QAPP/SOP (AMEC, 2012) was met for samples submitted for the analysis of TPH-DRO by EPA Method SW8015B. Dilutions were not required for TPH-DRO.

9.0 ANIONS (SW9056A)

Samples collected from site ST012 were submitted for Anions by Method SW9056A. A Level III validation was performed on this method and only those components that exceeded the QAPP/SOP criteria are presented below. Each of the Level III components was within the QAPP/SOP QC criteria; however the following qualification was noted:

- Constituents were present in the associated blanks and flagged "B" (no flags applied).

9.1 Continuing Calibration Blank

The CCBs associated with the samples in this SDG reported low levels of chloride.

Action: No qualification was necessary for chloride because the associated sample result was greater than five times the blank value.

9.2 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of Anions by USEPA Method SW 9056A with the exception of analytes that required dilution. The sample in this SDG required dilution for chloride resulting in elevated LOQs. The laboratory indicated a dilution with a "D" qualifier which was subsequently removed during the validation process.

10.0 METALS (SW6010C)

Samples collected from Site ST012 were submitted for the major metal cations by EPA Method SW6010C. Samples were analyzed for calcium, iron, magnesium, manganese, potassium, and sodium. A Level III validation was performed on this method and only those components that exceeded the SAP/TAL SOP criteria are presented below. The following components exceeded the QC criteria or were noted:

- Metals were detected in the Interference Check Solution A (ICSA) (no qualification required).
- PDS recoveries were outside QC limits for two metals (no flags applied).

10.1 Interference Check Solution A (ICSA)

Manganese was detected in the ICSA solution associated with prep batch 280-243607. The vendor verified that the ICSA contained these trace impurities.

Action: No qualification is required for impurities verified by the vendor.

10.2 Post Digestion Spike

The laboratory performed a PDS on sample ST012-W30-WG-091014 and the recoveries for calcium and manganese were outside of the QC limits. No qualification is required if the recoveries were high and the samples were non-detect or the analyte was present in the sample at concentrations greater than 4x the spike amount.

Action: No qualification was required for calcium and manganese results because the metals were present in the sample at greater than 4x the spike amount.

10.3 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of metals by USEPA Method SW6010C except where dilutions were required to place the constituent concentration within the calibration range. No Dilutions were required.

11.0 OVERALL SITE EVALUATION AND PROFESSIONAL JUDGMENT

Edits to the DQE qualifiers by professional judgment were not required.

12.0 SUMMARY OF DATA QUALITY INDICATORS

This section provides an assessment of the data based on project data quality indicators (DQIs) described on QAPP Worksheet #37 of the Program Document QAPP/SOP (AMEC, 2012). The DQIs consist of precision, accuracy, representativeness, comparability, completeness, and sensitivity.

12.1 Precision

An assessment of precision of analytical data is accomplished via review of field duplicate and MS/MSD analyses. Field duplicate and MS/MSD analyses are used to assess field variability, which includes sample collection/handling as well as matrix homogeneity. Precision is expressed as the relative percent difference (RPD) between results for duplicate pairs.

No field duplicate samples or project specific MS/MSDs were submitted. An MS/MSD was performed on a project sample for metals and the RPDs were within QC limits. Precision for TPH-GRO, TPH-DRO, and anions was evaluated through the analysis of the LCS/LCSD and the RPDs were compliant with the QAPP/SOP. The overall method and sample matrix precision are acceptable and achieve project objectives.

12.2 Accuracy (Bias)

An assessment of accuracy of analytical data is accomplished via evaluation of the spike recoveries in the MS/MSD, LCS, post digestion spike samples, and surrogate spike compounds, in addition to calibration criteria. Accuracy is expressed as percent recovery. Accuracy data were compliant with the QAPP/SOP with the exception of TPH-GRO surrogates; however, no data was qualified as a result. Accuracy data for anions, VOCs, TPH-DRO, and metals were within QC limits or did not require qualification. Therefore, the data results indicate method and matrix accuracy is acceptable to achieve project objectives.

12.3 Representativeness

Representativeness for the analytical data is determined through evaluation of the associated blank data and evaluation of appropriate sample handling procedures. All samples were properly stored and preserved in the field and at TestAmerica. Method, trip, and equipment blanks were acceptable. One calibration blank reported low-levels of chloride, however the blank contamination did not result in qualification of the associated sample data. Based on historical results, the impacts to project DQOs were minimal; therefore, the analytical results indicate sample data are representative of the Site conditions.

12.4 Comparability

Comparability addresses the confidence with which one data set can be compared to another. Use of appropriate sampling methods, COC procedures, and EPA-approved analytical methods, as well as adherence to strict QA/QC procedures, provide the basis for uniformity in sample collection and analysis. Analytical data were generated by TestAmerica using standard reporting units of micrograms per liter for VOCs, TPH-GRO, and metals and milligrams per liter for TPH-DRO and anions. In addition, sample collection and analytical method protocols were implemented in accordance with approved, documented procedures. Analytical data are determined to be comparable to previous Site results.

12.5 Completeness

Completeness of the field sampling activities were assessed in terms of the actual number and type of sample results received from the field and laboratory, as compared with the planned number and type of sample results. All samples planned were collected which meets a field completeness of 100%.

Analytical completeness of data is a measure of the number of valid project-specific data results obtained in comparison to the total number of data results projected to achieve project DQOs. Valid data are defined as data that meet the project-specific DQOs. No data were rejected as a result of the data validation; however, some of the results were qualified as estimated. Estimated data is usable data. The completeness goals met the 90 percent goal for field and laboratory data expected for this project.

12.6 Sensitivity

Analytical methods and RLs were implemented in accordance with the QAPP/SOP and EPA promulgated methodologies. Method RLs were achieved for the event except when sample

dilutions were required to bring target compounds within the linear range of the instrument calibration. As previously mentioned, the samples within this SDG required dilutions for VOCs, TPH-GRO, and chloride to place the results within the calibration range. These include modified RLs for selected detections; therefore, sensitivity requirements were met for non-diluted constituents.

12.7 Usability Summary

The data generated during the September 2014 sampling event were usable with qualifications with respect to project DQOs. The DQOs for the Enhanced Bioremediation Field Test is to produce data to support design of anaerobic methods for the ST012 remedy if selected.

13.0 REFERENCES

AFCEE, 2005. Quality Assurance Project Plan, Version 4.0.01, May, 2005.

AMEC, August 11, 2014. *Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) (Enhanced Bioremediation Field Test Plan) Operable Unit 2 Site ST012 - Liquid Fuels Storage Area, Former Williams Air Force Base, Mesa, Arizona*.

AMEC, February 23, 2012. *Performance Based Remediation Program Quality Assurance Project Plan (QAPP) and Standard Operating Procedures (SOPs) (QAP/SOP), Former Williams Air Force Base, Mesa, Arizona*.

DoD, 2010. Department of Defense Quality System Manual, Version 4.2 Final, October 2010.

Prepared/Date: DWK 10/24/14
Checked/Date: JAH 10/27/14

Flagged Data Reports

Client: AMEC Environment & Infrastructure, Inc. Job Number: 280-59873-1

Client Sample ID: **ST012-W30-WG-091014**

Lab Sample ID: 280-59873-1 Date Sampled: 09/10/2014 1056
Client Matrix: Water Date Received: 09/11/2014 0920

8260B Volatile Organic Compounds (GC/MS)

Analysis Method:	8260B	Analysis Batch:	280-243756	Instrument ID:	VMS_H
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	H4403.D
Dilution:	5.0			Initial Weight/Volume:	20 mL
Analysis Date:	09/18/2014 1524			Final Weight/Volume:	20 mL
Prep Date:	09/18/2014 1524				

DWK 10/24/14

Analyte	Result (ug/L)	Qualifier	DL	LOQ
1,2-Dichloroethane	2.0	U	0.65	5.0
Methylene Chloride	4.0	U	1.6	25
Naphthalene	84	~~D~~	1.1	5.0
Toluene	160	~~D~~	0.85	5.0
Trichloroethene (TCE)	1.0	U	0.80	5.0
Trichlorofluoromethane	4.0	U	1.5	10

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	118		70 - 120
4-Bromofluorobenzene (Surr)	103		75 - 120
Dibromofluoromethane (Surr)	110		85 - 115
Toluene-d8 (Surr)	113		85 - 120

Client: AMEC Environment & Infrastructure, Inc.

Job Number: 280-59873-1

Client Sample ID: **ST012-W30-WG-091014**

Lab Sample ID: 280-59873-1
Client Matrix: Water

Date Sampled: 09/10/2014 1056
Date Received: 09/11/2014 0920

8260B Volatile Organic Compounds (GC/MS)

Analysis Method:	8260B	Analysis Batch:	280-243756	Instrument ID:	VMS_H
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	H4404.D
Dilution:	50			Initial Weight/Volume:	20 mL
Analysis Date:	09/18/2014 1546	Run Type:	DL	Final Weight/Volume:	20 mL
Prep Date:	09/18/2014 1546				

DWK 10/3 9/14

Analyte	Result (ug/L)	Qualifier	DL	LOQ
Benzene	1900	D	8.0	50
Ethylbenzene	740	D	8.0	50
m-Xylene & p-Xylene	950	D	17	100
o-Xylene	85	D	9.5	50
Xylenes, Total	1000	D	9.5	100

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	101		70 - 120
4-Bromofluorobenzene (Surr)	98		75 - 120
Dibromofluoromethane (Surr)	101		85 - 115
Toluene-d8 (Surr)	108		85 - 120

Client: AMEC Environment & Infrastructure, Inc.

Job Number: 280-59873-1

Client Sample ID: **TB01-091014**

Lab Sample ID: 280-59873-2TB
Client Matrix: Water

Date Sampled: 09/10/2014 0000
Date Received: 09/11/2014 0920

8260B Volatile Organic Compounds (GC/MS)

Analysis Method:	8260B	Analysis Batch:	280-243756	Instrument ID:	VMS_H
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	H4392.D
Dilution:	1.0			Initial Weight/Volume:	20 mL
Analysis Date:	09/18/2014 1126			Final Weight/Volume:	20 mL
Prep Date:	09/18/2014 1126				

pwk
No Flags

Analyte	Result (ug/L)	Qualifier	DL	LOQ
1,2-Dichloroethane	0.40	U	0.13	1.0
Benzene	0.20	U	0.16	1.0
Ethylbenzene	0.20	U	0.16	1.0
Methylene Chloride	0.80	U	0.32	5.0
m-Xylene & p-Xylene	0.80	U	0.34	2.0
Naphthalene	0.80	U	0.22	1.0
o-Xylene	0.40	U	0.19	1.0
Toluene	0.40	U	0.17	1.0
Trichloroethene (TCE)	0.20	U	0.16	1.0
Trichlorofluoromethane	0.80	U	0.29	2.0
Xylenes, Total	1.6	U	0.19	2.0

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	102		70 - 120
4-Bromofluorobenzene (Surr)	97		75 - 120
Dibromofluoromethane (Surr)	100		85 - 115
Toluene-d8 (Surr)	105		85 - 120

Client: AMEC Environment & Infrastructure, Inc.

Job Number: 280-59873-1

Client Sample ID: **ST012-W30-WG-091014**

Lab Sample ID: 280-59873-1
Client Matrix: Water

Date Sampled: 09/10/2014 1056
Date Received: 09/11/2014 0920

8015B_GRO Gasoline Range Organics (GRO)

Analysis Method:	8015B_GRO	Analysis Batch:	280-243683	Instrument ID:	VGC_Q
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	001F1601.D
Dilution:	20			Initial Weight/Volume:	5 mL
Analysis Date:	09/17/2014 1935			Final Weight/Volume:	5 mL
Prep Date:	09/17/2014 1935			Injection Volume:	5 mL

Analyte	Result (ug/L)	Qualifier	DL	LOQ
Gasoline Range Organics (GRO)-C6-C10	14000	~~D M Q~~	200	500

Surrogate	%Rec	Qualifier	Acceptance Limits
a,a,a-Trifluorotoluene	181	~~M Q~~ *	82 - 110

Client: AMEC Environment & Infrastructure, Inc.

Job Number: 280-59873-1

Client Sample ID: **TB01-091014**

Lab Sample ID: 280-59873-2TB
Client Matrix: Water

Date Sampled: 09/10/2014 0000
Date Received: 09/11/2014 0920

8015B_GRO Gasoline Range Organics (GRO)

Analysis Method:	8015B_GRO	Analysis Batch:	280-243077	Instrument ID:	VGC_Q
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	017F2301.D
Dilution:	1.0			Initial Weight/Volume:	5 mL
Analysis Date:	09/12/2014 1939			Final Weight/Volume:	5 mL
Prep Date:	09/12/2014 1939			Injection Volume:	5 mL

DUP
No Flags

Analyte	Result (ug/L)	Qualifier	DL	LOQ
Gasoline Range Organics (GRO)-C6-C10	20	U	10	25

Surrogate	%Rec	Qualifier	Acceptance Limits
a,a,a-Trifluorotoluene	93		82 - 110

Client: AMEC Environment & Infrastructure, Inc.

Job Number: 280-59873-1

Client Sample ID: **ST012-W30-WG-091014**

Lab Sample ID: 280-59873-1
Client Matrix: Water

Date Sampled: 09/10/2014 1056
Date Received: 09/11/2014 0920

8015B_DRO Diesel Range Organics (DRO) (GC)

Analysis Method:	8015B_DRO	Analysis Batch:	280-243251	Instrument ID:	SGC_U2a
Prep Method:	3510C	Prep Batch:	280-243123	Initial Weight/Volume:	1024.1 mL
Dilution:	1.0			Final Weight/Volume:	1 mL
Analysis Date:	09/16/2014 0313			Injection Volume:	1 uL
Prep Date:	09/12/2014 2029			Result Type:	PRIMARY

DWK 10/21/14

Analyte	Result (mg/L)	Qualifier	DL	LOQ
Diesel Range Organics [C10-C28]	11	M	0.032	0.24

Surrogate	%Rec	Qualifier	Acceptance Limits
o-Terphenyl	78	M	50 - 115

Client: AMEC Environment & Infrastructure, Inc.

Job Number: 280-59873-1

Client Sample ID: **ST012-W30-WG-091014**

Lab Sample ID: 280-59873-1
Client Matrix: Water

Date Sampled: 09/10/2014 1056
Date Received: 09/11/2014 0920

6010C Metals (ICP)

Analysis Method:	6010C	Analysis Batch:	280-243607	Instrument ID:	MT_026
Prep Method:	3010A	Prep Batch:	280-243011	Lab File ID:	26A091614.asc
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	09/16/2014 1333			Final Weight/Volume:	50 mL
Prep Date:	09/15/2014 0915				

DWK 10/24/14

Analyte	Result (ug/L)	Qualifier	DL	LOQ
Calcium	200000		35	1000
Iron	2700		22	100
Magnesium	43000		11	500
Manganese	3200	Ø	0.25	10
Potassium	55000		240	3000
Sodium	60000		92	5000

General Chemistry

Client Sample ID: **ST012-W30-WG-091014**

Lab Sample ID: 280-59873-1 Date Sampled: 09/10/2014 1056
Client Matrix: Water Date Received: 09/11/2014 0920

DWK 10/24/14

Analyte	Result	Qual	Units	DL	LOQ	Dil	Method
Bromide	2.3		mg/L	0.11	0.50	1.0	9056A
Analysis Batch: 280-242847	Analysis Date: 09/11/2014 1813						
Orthophosphate as P	0.20	U	mg/L	0.19	0.50	1.0	9056A
Analysis Batch: 280-242846	Analysis Date: 09/11/2014 1813						
Chloride	510	D	mg/L	2.5	30	10	9056A
Analysis Batch: 280-242847	Analysis Date: 09/12/2014 0251						
Sulfate	13		mg/L	0.23	5.0	1.0	9056A
Analysis Batch: 280-242847	Analysis Date: 09/11/2014 1813						

Data Quality Evaluation Checklists

Method Validated: 8260B

Initial Review by: D. Knaub Date: 10/24/14 SDG#: 280-59873-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (METHODS 8260 AND 8270)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C).	QC acceptance criteria published by DoD, if available; otherwise method- specific criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	NA	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	Ok
MDL Study	At initial set-up and subsequently once per 12-month period; otherwise quarterly MDL verification checks shall be performed (see box D-18)	See 40 CFR 136B. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL verification check at higher level and set MDL higher or reconduct MDL study (see box D-18)	NA	Samples cannot be analyzed without a valid MDL.	Ok
Tuning	Prior to calibration and every 12 hours during sample analysis	Refer to method for specific ion criteria.	Retune instrument and verify. Rerun affected samples.	Flagging criteria are not appropriate	Problem must be corrected. No samples may be accepted without a valid tune.	p. 220-221 level IV package VMS_H, ICAL/ICV, 9/17/14 VMS_H, CCV 9/18/14 All ok
Breakdown Check (DDT Method 8270C Only)	Daily prior to analysis of samples	Degradation ≤ 20% for DDT	Correct problem then repeat breakdown check	Flagging criteria are not appropriate	No samples shall be run until degradation ≤ 20%. Benzidine and pentachlorophenol should be present at their normal responses and no peak tailing should be observed.	NA

Method Validated: 8260B

Initial Review by: D. Knaub Date: 10/24/14 SDG#: 280-59873-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (METHODS 8260 AND 8270)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Container, Preservation, and Holding Time	All field samples	8260 – 40 ml VOA vial HCl to pH < 2, Cool to 4°C 14 days to analysis 8270 – 1 L Amber glass, Cool to 4°C 7 days to extraction 40 days to analysis	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collection date: 9/10/14 Analysis date: 9/18/14, Temp 1.7 °C (CoC) Narrative: 1.0°C OK
Minimum Five-Point Initial Calibration For All Analytes (ICAL)	Initial calibration prior to sample analysis	Average response factor (RF) for SPCCs: VOCs - 0.30 for Chlorobenzene and 1,1,2,2-tetrachlorolethane. a 0.1 for chloromethane, bromoform, and 1,1-dicbloroethane. SVOCs - a 0.050. RSD for RFs for CCCs: The CCCs are vinyl chloride, 1,1-dichlorethene, chloroform, 1,2-dichloropropane, toluene, and ethylbenzene. VOCs and SVOCs - 30% and one option below; **Option 1**: RSD for each analyte ≤ 15% **Option 2**: linear least squares regression r a 0.995 **Option 3**: non-linear regression - coefficient of determination (COD) e a 0.99 (6 points shall be used for second order, 7 points shall be used for third order)	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.	p. 240 VMS_H, 9/17/14 All OK p. 287 VMS_H, 9/17/14 (short list) All OK

Method Validated: 8260B

Initial Review by: D. Knaub Date: 10/24/14 SDG#: 280-59873-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (METHODS 8260 AND 8270)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 25% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	VMS_H ICV not included in data packages Analyzed on 9/17/14 at 12:53 & 15:46 – see run log on page 349.
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL	Position shall be set using the midpoint standard of the initial calibration curve.	NA			All OK
Evaluation of Relative Retention Times (RRT)	With each sample	RRT of each target analyte in each calibration standard within ± 0.06 RRT units.	Correct problem, then rerun ICAL.			All ok
Calibration Verification (CV)	Daily, before sample analysis, and every 12 hours of analysis time	Average RF for SPCCs: VOCs 0.30 for Chlorobenzene and 1,1,2,2-tetrachlorolethane, 0.1 for chloromethane, bromoform, and 1,1-dichloroethane. SVOCs 0.050. 2. %Difference/Drift for CCCs: VOCs and SVOCs ≤20%D (Note: D = difference when using RFs or drift when using least squares regression or non-linear calibration.)	Correct problem, then rerun CV. If that fails, repeat initial calibration. See section 5.5.10 and DoD clarification box 55.	Apply Q-flag if no sample material remains and analyte exceeds criteria.	NA	p. 312, VMS_H CCV 280-243756/2 (9/18/14) p. 328 VMS_H CCV (short list) 280-243756/3 (9/18/14) All COIs OK

Method Validated: 8260B

Initial Review by: D. Knaub Date: 10/24/14 SDG#: 280-59873-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (METHODS 8260 AND 8270)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Internal Standards Verification	In all field samples and standards	Retention time ± 30 seconds from retention time of the midpoint standard in the ICAL EICP area within - 50% to + 100% of ICAL midpoint standard	Inspect mass spectrometer and GC for malfunctions. Reanalysis of samples analyzed while system was malfunctioning is mandatory.	If corrective action fails in field samples, apply Q-flag to analytes associated with the non-compliant IS. Flagging criteria are not appropriate for failed standards.	Flagging criteria are not appropriate.	p. 222 -224 ICIS 280-243577/22 All ok
Method Blank	One per preparatory batch	No analytes detected >½ RL. For common laboratory contaminants, no analytes detected > RL.	Correct problem, then see criteria in box D-5. If required, reprep and reanalyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch.		p.43 MB 280-243756/6 All ND
LCS Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	QC acceptance criteria specified by DoD, if available; see box D-7 and Appendix DoD-D.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. (See full explanation in Appendix DoDID.	If corrective action fails, applyIQ-flag to specific analyte(s) in all samples in the associated preparatory batch.		p.44 LCS 280-243756/4 All OK
MS	One MS per preparatory batch per matrix (see box D- 15)	For matrix evaluation, use QC acceptance criteria specified by DoD for LCS.	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	Lab: For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error	No MS/MSD submitted for method 8260B

Method Validated: 8260B

Initial Review by: D. Knaub Date: 10/24/14 SDG#: 280-59873-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (METHODS 8260 AND 8270)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
MSD or Sample Duplicate	One per preparatory batch per matrix	RPD ≤ 30% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	Lab: For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	NA -See above
Surrogate Spike (Analytes Identified in Appendix DoD-D)	All field and QC samples	QC acceptance criteria for LCS published by DoD, if available; otherwise method- specified criteria or laboratory's own in-house criteria.	For QC and field samples, correct problem, then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available.	For the specific analyte(s) in all field samples collected from the same site matrix as the parent, apply J-flag if acceptance criteria are not met. For QC samples, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.		p. 40 All OK.
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤30%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		None in this SDG
Results Reported Between MDL and LOQ	NA	NA	NA	Apply J-flag to all results between MDL and LOQ. Validator flags: If using AFCEE; Apply "F" flag		Samples qualified as estimated and AFCEE flagged "F" unless overridden by flags for other criteria

Method Validated: 8260B

Initial Review by: D. Knaub Date: 10/24/14 SDG#: 280-59873-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (METHODS 8260 AND 8270)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
QC Blanks (Trip Blanks, Equipment Blanks, and Field Blanks)	Trip Blank – one per cooler containing samples for VOCs Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B"		TB01-091014 All ND

Method Validated: 8015B (TPH-GRO) Initial Review by: D. Knaub Date: 10/24/14 SDG#:280-59873-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	ok
Method Detection Limit (MDL) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly MDL verification checks shall be performed (see box 0-18)	See 40 CFR 1368. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL verification check at higher level and set MDL higher or reconduct MDL study (see box D-18).	NA	Samples cannot be analyzed without a valid MDL.	ok
Retention Time (RT) Window Width Calculated for Each Analyte and Surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 72-hour study.	NA	NA		
Breakdown Check (Endrin/ DDT Method 8081 Only)	Daily prior to analysis of samples	Degradation ≤ 15% for both Endrin and DDT.	Correct problem then repeat breakdown check.	Flagging criteria are not appropriate	No samples shall be run until degradation ≤ 15%.	NA TPH-GRO

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Container, Preservation, and Holding Time	All field samples	GRO- Water: 40 ml VOA vial; HCl to pH < 2, Cool to 6°C Soil: (low-level) 5 g in 40 ml VOA w/H_2O or sodium bisulfate; Cool to 6°C (high-level) 5 g in 40 ml VOA w/methanol, Cool to 6°C, or EnCore® or equivalent (48 hrs to preservation) 14 days to analysis DRO – Water: 1 L Amber glass, Cool to 6°C Soil: 4 oz amber glass jar, Cool to 6°C Water: 7 days to extraction Soil: 14 days to extraction 40 days to analysis	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collected: 9/10/14 Temp=1.7°C (CoC) Narrative; 1.0°C Analyzed: 9/12/14, 9/17/14 ***ok***

Method Validated: 8015B (TPH-GRO) Initial Review by: D. Knaub Date: 10/24/14 SDG#:280-59873-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Minimum Five-Point Initial Calibration For All Analytes (ICAL)	Initial calibration prior to sample analysis	One of the options below (except for Method 8082, which may only use Option 1 or 2): Option 1: RSD for each analyte ≤ 20% Option 2: linear least squares regression: r 2 ≥0.995 Option 3: non-linear regression: coefficient of determination (COD) r2 ≥0.99 (6 points shall be used for second order, 7 points shall be used for third order)	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed. For PCB analysis, a mixture of Aroclors 1016 and 1260 is normally used to establish detector calibration linearity, unless project-specific data suggest the presence of another Aroclor (e.g., 1232). In addition, a mid-level or lower standard for each of the remaining Aroclors is analyzed for pattern recognition and response factor.	p. 384 Inst VGC_Q 3/12/14 OK
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 20% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	p. 412 ICV 280-216544/11 3/12/14 Inst VGC_Q
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL and at the beginning of the analytical shift	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift.	NA	NA		p. 383 ICAL

Method Validated: 8015B (TPH-GRO) Initial Review by: D. Knaub Date: 10/24/14 SDG#:280-59873-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time Window Verification for Each Analyte and Surrogate	Each calibration verification standard	Analyte within established window	Correct problem, then reanalyze all samples analyzed since the last acceptable retention time check. If they fail, redo ICAL and reset retention time window,	Flagging criteria are not appropriate for initial verification. For CCV, apply a Q-flag to all results for analytes outside the established window.	No samples shall be run without a verified retention time window at the initial verification. For method 8015, check state methods for use of modified retention time markers with gasoline range organics (GRO) or diesel range organics (DRO).	p. 413 ICV p. 419, 426, 433, 440, 447 CCVs
Calibration Verification (Initial [ICV] and Continuing [CCV])	ICV: Daily, before sample analysis CCV: After every 10 field samples and at the end of the analysis sequence	All analytes within ± 20% of expected value from the ICAL	ICV: Correct problem, rerun ICV. If that fails, repeat initial calibration. See section 5.5.10 and box 55. CCV: Correct problem then repeat CCV and reanalyze all samples since last successful calibration verification.	ICV: Flagging criteria are not appropriate. CCV: Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification, if . reanalysis is not possible.	If %D for an individual analyte is > 20%, no samples may be analyzed until the problem has been corrected.	p. 412 ICVRT 280-216544/11 3/12/14 Inst VGC_Q OK p. 418 CCV 280-243077/3 9/12/14 Inst VGC_Q OK p. 425 CCV 280-243077/19 9/12/14 Inst VGC_Q OK p. 432 CCV 280-243077/30 9/12/14 Inst VGC_Q OK p. 439 CCV 280-243683/3 9/17/14 Inst VGC_Q p. 446 CCV 280-243683/17 9/17/14 Inst VGC_Q

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Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Method Blank	One per preparatory batch	No analytes detected > ½RL. For common laboratory contaminants, no analytes detected > RL.	Correct problem, then see criteria in box 0-5; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch		p. 45 MB 280-243077/4 ND p. 47 MB 280-243683 /4 ND
Laboratory Control Sample (LCS) Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	QC acceptance criteria specified by DoD, if available; see box D-7 and Appendix DoD-D .	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix DoD D)	If corrective action fails apply J-flag to specific analyte(s) in all samples in the associated preparatory batch		p. 46, LCS/LCSD 280-243077/5,6 GRO = 119, 109 RPD = 8 p. 47, LCS/LCSD 280-243683/5,6 GRO = 103, 104 RPD = 1
Matrix Spike (MS)	One MS per preparatory batch per matrix (see box ID- 11)	For matrix evaluation, use QC acceptance criteria specified by DoD for LCS.	Examine the project-specific DQOs. Contact the client as to additional measures to be taken,	Lab: For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	No MS/MSD submitted with this SDG
Matrix Spike Duplicate (MSD) or Sample Duplicate	One per preparatory batch per matrix	RPD ≤30% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	Lab: For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	No MSD performed with this SDG

Method Validated: 8015B (TPH-GRO) Initial Review by: D. Knaub Date: 10/24/14 SDG#:280-59873-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤30%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		None in this SDG
Surrogate Spike (Analytes Identified in Appendix DoD-D)	All field and QC samples	QC acceptance criteria for LCS specified by DoD, if available; otherwise method- specified criteria or laboratory's own in-house criteria	For QC and field samples, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	For the specific analyte(s) in all field samples collected from the same site matrix as the parent, apply J-flag if acceptance criteria are not met. For QC samples, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	Alternative surrogates are recommended when there is obvious chromatographic interference.	p. 41 ST012-W30-WG-091014= 181% *No flag, assoc. result anal. at a 20x dilution*
Confirmation of Positive Results (Second Column or Second Detector)	All positive results must be confirmed (in Method 8081A exclude toxaphene and technical chlordane, in Method 8015B exclude GRO, DRO, and residual range organics (RRO)).	Calibration and QC criteria same as for initial or primary column analysis. Results between primary and second column RPD ≤ 40%.	NA	Apply J-flag if RFD > 40% or Q-flag if sample is not confirmed. Discuss in the case narrative.	Report the higher of two confirmed results unless overlapping peaks are causing erroneously high results, then report the non- affected result and document in the case narrative.	NA

Method Validated: 8015B (TPH-GRO) Initial Review by: D. Knaub Date: 10/24/14 SDG#:280-59873-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between LOD and LOQ. Validator flags: If using AFCEE; Apply "F" flag		No targets detected between LOD and LOQ
QC Blanks (Trip Blanks, Equipment Blanks, and Field Blanks)	Trip Blank – one per cooler containing samples for volatile parameters Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B"		TB01-090814 ND for GRO

Method Validated: 8015B (TPH-DRO) Initial Review by: D. Knaub Date: 10/24/14 SDG#:280-59873-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	ok
Method Detection Limit (MDL) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly MDL verification checks shall be performed (see box 0-18)	See 40 CFR 1368. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL verification check at higher level and set MDL higher or reconduct MDL study (see box D-18).	NA	Samples cannot be analyzed without a valid MDL.	ok
Retention Time (RT) Window Width Calculated for Each Analyte and Surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 72-hour study.	NA	NA		
Breakdown Check (Endrin/ DDT Method 8081 Only)	Daily prior to analysis of samples	Degradation ≤ 15% for both Endrin and DDT.	Correct problem then repeat breakdown check.	Flagging criteria are not appropriate	No samples shall be run until degradation ≤ 15%.	NA TPH-DRO

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Container, Preservation, and Holding Time	All field samples	GRO- Water: 40 ml VOA vial; HCl to pH < 2, Cool to 6°C Soil: (low-level) 5 g in 40 ml VOA w/H_2O or sodium bisulfate; Cool to 6°C (high-level) 5 g in 40 ml VOA w/methanol, Cool to 6°C, or EnCore® or equivalent (48 hrs to preservation) 14 days to analysis DRO – Water: 1 L Amber glass, Cool to 6°C Soil: 4 oz amber glass jar, Cool to 6°C Water: 7 days to extraction Soil: 14 days to extraction 40 days to analysis	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collected: 9/10/14 Temp= 1.7 °C (CoC) Narrative: 1.0°C Extracted; 9/12/14 Analyzed: 9/16/14 ***ok***

Method Validated: 8015B (TPH-DRO) Initial Review by: D. Knaub Date: 10/24/14 SDG#:280-59873-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Minimum Five-Point Initial Calibration For All Analytes (ICAL)	Initial calibration prior to sample analysis	One of the options below (except for Method 8082, which may only use Option 1 or 2): Option 1: RSD for each analyte ≤ 20% Option 2: linear least squares regression: r 2 ≥0.995 Option 3: non-linear regression: coefficient of determination (COD) r2 ≥0.99 (6 points shall be used for second order, 7 points shall be used for third order)	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed. For PCB analysis, a mixture of Aroclors 1016 and 1260 is normally used to establish detector calibration linearity, unless project-specific data suggest the presence of another Aroclor (e.g., 1232). In addition, a mid-level or lower standard for each of the remaining Aroclors is analyzed for pattern recognition and response factor.	p. 499 Inst SGC_U 2a 3/26/14 OK
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 20% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	p. 540 ICV 280-218430/11 3/26/14 Inst SGC_U2a
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL and at the beginning of the analytical shift	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift.	NA	NA		p. 498 ICAL

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time Window Verification for Each Analyte and Surrogate	Each calibration verification standard	Analyte within established window	Correct problem, then reanalyze all samples analyzed since the last acceptable retention time check. If they fail, redo ICAL and reset retention time window,	Flagging criteria are not appropriate for initial verification. For CCV, apply a Q-flag to all results for analytes outside the established window.	No samples shall be run without a verified retention time window at the initial verification. For method 8015, check state methods for use of modified retention time markers with gasoline range organics (GRO) or diesel range organics (DRO).	p. 541 ICV p. 549 CCV p. 556 CCV p. 563 CCV p. 570 CCV
Calibration Verification (Initial [ICV] and Continuing [CCV])	ICV: Daily, before sample analysis CCV: After every 10 field samples and at the end of the analysis sequence	All analytes within ± 20% of expected value from the ICAL	ICV: Correct problem, rerun ICV. If that fails, repeat initial calibration. See section 5.5.10 and box 55. CCV: Correct problem then repeat CCV and reanalyze all samples since last successful calibration verification.	ICV: Flagging criteria are not appropriate. CCV: Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification, if . reanalysis is not possible.	If %D for an individual analyte is > 20%, no samples may be analyzed until the problem has been corrected.	p. 540 ICV 280-218430/11 3/26/14 Inst SGC_U2a p. 548 CCV 280-243251/3 9/15/14 Inst SGC_U2a p. 555 CCV 280-243251/25 9/15/14 Inst SGC_U2a p. 562 CCV 280-243251/37 9/16/14 Inst SGC_U2a p. 569 CCV 280-243251/43 9/16/14 Inst SGC_U2a

Method Validated: 8015B (TPH-DRO) Initial Review by: D. Knaub Date: 10/24/14 SDG#:280-59873-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Method Blank	One per preparatory batch	No analytes detected > ½RL. For common laboratory contaminants, no analytes detected > RL.	Correct problem, then see criteria in box 0-5; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch		p. 49 MB 280-243123/1-A DRO=ND
Laboratory Control Sample (LCS) Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	QC acceptance criteria specified by DoD, if available; see box D-7 and Appendix DoD-D .	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix DoD D)	If corrective action fails apply J-flag to specific analyte(s) in all samples in the associated preparatory batch		p. 49 LCS/LCSD 280-242123/ 2-A,3-A DRO = 83, 77 RPD = 7
Matrix Spike (MS)	One MS per preparatory batch per matrix (see box ID- 11)	For matrix evaluation, use QC acceptance criteria specified by DoD for LCS.	Examine the project-specific DQOs. Contact the client as to additional measures to be taken,	Lab: For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	No MS/MSD submitted with this SDG
Matrix Spike Duplicate (MSD) or Sample Duplicate	One per preparatory batch per matrix	RPD ≤30% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	Lab: For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	No MSD or lab dup performed with this SDG

Method Validated: 8015B (TPH-DRO) Initial Review by: D. Knaub Date: 10/24/14 SDG#:280-59873-1
Senior Review by: J. Hartness Date: 10/27/14 Matrix: Groundwater

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤30%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		None in this SDG
Surrogate Spike (Analytes Identified in Appendix DoD-D)	All field and QC samples	QC acceptance criteria for LCS specified by DoD, if available; otherwise method- specified criteria or laboratory's own in-house criteria	For QC and field samples, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	For the specific analyte(s) in all field samples collected from the same site matrix as the parent, apply J-flag if acceptance criteria are not met. For QC samples, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	Alternative surrogates are recommended when there is obvious chromatographic interference.	p. 42 **All ok**
Confirmation of Positive Results (Second Column or Second Detector)	All positive results must be confirmed (in Method 8081A exclude toxaphene and technical chlordane, in Method 8015B exclude GRO, DRO, and residual range organics (RRO)).	Calibration and QC criteria same as for initial or primary column analysis. Results between primary and second column RPD ≤ 40%.	NA	Apply J-flag if RFD > 40% or Q-flag if sample is not confirmed. Discuss in the case narrative.	Report the higher of two confirmed results unless overlapping peaks are causing erroneously high results, then report the non- affected result and document in the case narrative.	NA

ORGANIC ANALYSIS BY GAS CHRO000MATOGRAPHY AND HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (METHODS 8011, 8015, 8021, 8070, 8081, 8082, 8141, 8151, 8310, AND 8330)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between LOD and LOQ. Validator flags: If using AFCEE; Apply "F" flag		No targets detected between LOD and LOQ
QC Blanks (Trip Blanks, Equipment Blanks, and Field Blanks)	Trip Blank – one per cooler containing samples for volatile parameters Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B"		No EB

Method Validated: 6010 | Initial Review by: D. Knaub | Date: 10/24/14 | SDG#:280-59873-1
Senior Review by: J. Hartness | Date: 10/27/14 | Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETRY (METHOD 6010)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	Ok
Instrument Detection Limit (IDL) Study	At initial set-up and after significant change in instrument type, personnel, test method, or sample matrix	IDL shall be ≤ Limit of Detection (LOD)	NA	NA		p. 610 6/11/13
Container, Preservation, and Holding Time	All field samples	Water: 500 ml Poly, HNO_3 to pH < 2, Cool to 6°C, Soil: 4 oz glass or poly jar, Cool to 6°C 180 days to analysis	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collection date: 9/10/14 Prep; 9/15/14 Analysis date: 9/16/14 Temp:1.7 °C (CoC) Narrative: 1.0°C Ok
Initial calibration (ICAL) for all analytes (minimum one high standard and a calibration blank)	Daily ICAL prior to sample analysis	If more than one calibration standard is used, r ≥ 0.995.	Correct problem then repeat ICAL.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.	p. 620 run log ICIS analyzed 9/16/2014 11:11 IC analyzed 9/16/2014 11:13 and 11:16

Method Validated: 6010 | Initial Review by: D. Knaub | Date: 10/24/14 | SDG#:280-59873-1
Senior Review by: J. Hartness | Date: 10/27/14 | Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETRY (METHOD 6010)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Second Source Calibration Verification (ICV)	Once after each ICAL, prior to beginning sample run	Value of second source for all analytes within ± 10% of true value	Correct problem and verify second source standard. Rerun ICV. If that fails, correct problem and repeat ICAL.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	p. 597 ICVH 280-243607/6 9/16/2014 All OK p. 598 ICV 280-243607/7 9/16/2014 All OK p. 599 ICVL 280-243607/8 9/16/2014 All OK
Continuing Calibration Verification (CCV)	After every 10 field samples and at the end of the analysis sequence	All analytes within ± 10% of true value	Correct problem, rerun CCV. If that fails, then repeat ICAL. Reanalyze all samples since last successful calibration verification	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q-flag to all results for the specific analyte(s) of interest in all samples since the last acceptable CCV. Validator flags: If using AFCEE; Apply "J" flag only if reanalysis cannot be performed	Problem must be corrected. Results may not be reported without a valid CCV. Flagging is only appropriate in cases where the samples cannot be reanalyzed.	p. 597 CCVH 280-243607/42,53 9/16/14 All OK p. 598 CCV 280-243607/43, 54 9/18/14 All OK p. 599 CCVL 280-243607/45, 56 9/18/14 All OK
Low-level calibration check standard	Daily, after one-point ICAL	Within ± 20% of true value	Correct problem, then reanalyze	Flagging criteria are not appropriate.	No samples may be analyzed without a valid low-level calibration check standard. Low-level calibration check standard should be less than or equal to the reporting limit.	p.600 ***All OK***

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETRY (METHOD 6010)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Linear dynamic range or high-level check standard	Every 6 months -	Within ±10% of expected value	NA	NA		p. 618 7/21/14
Method Blank	One per preparatory batch	No analytes detected > ½ RL and greater than 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL (see Box D-1).	Correct problem, then see criteria in box D-1; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch	Problem must be corrected. Results may not be reported without a valid method blank. Flagging is only appropriate in cases where samples cannot be reanalyzed.	p. 51 MB-280-243011/1-A All ND
Calibration blank	Before beginning a sample run, after every 10 samples, and at end of the analysis sequence	No analytes detected > LOD	Correct problem. Reprep and reanalyze calibration blank. All samples following the last acceptable calibration blank must be reanalyzed	Apply B-flag to all results for specific analyte(s) in all samples associated with the blank.		p. 601 9/16/14 ICB/CCBs 280-243607/11,44,55 ND
Interference check solutions (ICS-A and ICS-AB)	At the beginning of an analytical run and every 12 hours	ICS-A: Absolute value of concentration for all non-spiked analytes < LOD (unless they are a verified trace impurity from one of the spiked analytes) ICS-AB: Within ±20% of expected value	Terminate analysis, locate and correct problem, reanalyze ICS, reanalyze all samples.	If corrective action fails, apply Q-flag to all results for specific analyte(s) in all samples associated with the ICS. Validator flags: If using AFCEE; Apply "M" flag		p. 603 9/16/14 ICSA - ICS-A Mn >LOD *No qualification- vendor verified trace impurities* p. 604 9/16/14 ICSAB All OK

Method Validated: 6010 | Initial Review by: D. Knaub | Date: 10/24/14 | SDG#:280-59873-1
Senior Review by: J. Hartness | Date: 10/27/14 | Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETRY (METHOD 6010)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Laboratory Control Sample (LCS) Containing All Analytes to be Reported	One per preparatory batch	QC acceptance criteria specified by DoD, if available; see box D-3 and Appendix G.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix G)	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch Validator flags: If using AFCEE; Apply "J" flag	Problem must be corrected. Results may not be reported without a valid LCS. Flagging is only appropriate in cases where the samples cannot be reanalyzed.	p. 51 LCS-280-243011/2-A 9/16/14 All OK
Matrix Spike (MS)	One per preparatory batch per matrix (see box D-7)	For matrix evaluation, use QC acceptance criteria specified by DoD for LCS.	Examine the project-specific DQOs. If the matrix spike falls outside of DoD criteria, additional quality control test (dilution test and post-digestion spike addition) are required to evaluate matrix effects.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	p. 52 ST012-W30-WG-091014 All ok
Matrix Spike Duplicate (MSD)	One per preparatory batch per matrix (see Box D-7)	MSD: For matrix evaluation use QC acceptance criteria specified by DoD for LCS MSD RPD < 20%	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	p. 52 ST012-W30-WG-091014 RPDs All ok
Dilution test	Once per preparatory batch	Five-fold dilution must agree within ± 10% of the original measurement	Perform post-digestion spike addition.	Flagging criteria are not appropriate.	Only applicable for samples with concentrations > 50 x LOQ.	p. 53 ST012-W30-WG-091014 All OK
Post digestion spike addition	When dilution test fails or analyte concentration for all samples < 50 x LOQ	Recovery within 75-125% of (see Table B-1)	Run all associated samples in the preparatory batch by method of standard additions (MSA) or see flagging criteria.	For specific analyte(s) in the parent sample, apply J-flag of acceptance criteria are not met.	Spike addition should produce a concentration of 10 - 100 x LOQ	p. 52 Ca = 62% Mn = -104% ***No qualification: sample results greater than 4x spike amount***

Method Validated: 6010 | Initial Review by: D. Knaub | Date: 10/24/14 | SDG#:280-59873-1
Senior Review by: J. Hartness | Date: 10/27/14 | Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETRY (METHOD 6010)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Method of standard additions (MSA)	When matrix interference is suspected	NA	NA	NA	Document use of MSA in the case narrative.	NA
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD 20%	Qualify samples	For the specific analyte(s) in the parent & dup samples, apply J-flag if acceptance criteria are not met.		None in this SDG
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between DL and LOQ. Validator flags: If using AFCEE; Apply "F" flag		Results reported between MDL and RL flagged "F" for AFCEE.
QC Blanks (Equipment Blanks, and Field Blanks)	Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value are qualified as estimated and flagged "B".		No EB

Method Validated: 9056A

Initial Review by: D. Knaub Date: 10/24/14

Senior Review by: J. Hartness Date: 10/27/14

SDG#: 280-59873-1

Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	ok
Limit of Detection Determination and Verification (LOD) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOD verification checks shall be performed (see box D-13)	See 40 CFR 1368. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL / LOD verification check at higher level and set MDL higher or reconduct MDL study (see box D-13).	NA	Samples cannot be analyzed without a valid MDL.	p. 1075 6/16/2013
Limit of Quantitation Establishment and Verification (LOQ) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOQ verification checks shall be performed (see box D-14)	Within calibration range including low standard; within method precision and accuracy.	Re-run LOQ	NA	Samples cannot be analyzed without a valid LOQ	MRL check: Level 4 Package Pg. 54, 56,1074 (9/11/14) = All OK

Method Validated: 9056A

Initial Review by: D. Knaub Date: 10/24/14

Senior Review by: J. Hartness Date: 10/27/14

SDG#: 280-59873-1

Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time (RT) Window Width Calculated for Each Analyte and Surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 24-hour study.	NA	NA		OK
Container, Preservation, and Holding Time	All field samples	500 ml poly, Cool to 4°C Nitrate – 48 hours Nitrite, sulfate, chloride – 28 days	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collected: 9/10/14 Temp: 1.7**°C** (CoC) Narrative: 1.0**°C** Analyzed: 9/11/14
ICAL for All Analytes (Minimum Three Standards and One Calibration Blank)	Initial calibration prior to sample analysis	R ≥ 0.995	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.	p. 1079 Level IV package 8/27/14 6 levels Inst. IC11 OK
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 10% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	p. 1090 Level 4 Package OK
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL and at the beginning of the analytical shift	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift.	NA	NA		OK

Method Validated: 9056A | Initial Review by: D. Knaub | Date: 10/24/14 | SDG#: 280-59873-1
Senior Review by: J. Hartness | Date: 10/27/14 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Midrange Continuing Calibration Verification (CCV)	After every 10 field samples and at end of the analysis sequence.	All analytes within established retention time windows and within ± 10% of true value	Correct problem then repeat CCV. If that fails, then repeat ICAL. Reanalyze all samples since last successful calibration verification.	Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification, if . reanalysis is not possible.	No samples may be analyzed until the problem has been corrected.	p. 1069-1070 Level IV Package 9/11/14 All OK
Method Blank	One per preparatory batch	No analytes detected > ½ RL. See box D-1.	Correct problem, then see criteria in box D-1; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	Lab: Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch. Validator; Apply "B" flag if result is less than 5x method blank.		p. 54 MB 280-242846/6 ortho-P = ND p. 56 MB 280-242847/6 All ND p. 1070: CCBs CCBs (9/11/14) Cl = 0.631, 0.640, 0.643 *No assoc. results < 5x blank, no flags necessary*

Method Validated: 9056A | Initial Review by: D. Knaub | Date: 10/24/14 | SDG#: 280-59873-1
Senior Review by: J. Hartness | Date: 10/27/14 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Laboratory Control Sample (LCS) Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	Use laboratory in-house LCS acceptance criteria (not to exceed 20%).See Box D-3.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix G)	If corrective action fails apply J-flag to specific analyte(s) in all samples in the associated preparatory batch		p. 54 ortho-P = 99, 101 p. 57 Br = 99, 100 Cl = 99, 99 SO4 = 95, 95 All OK
Matrix Spike (MS)	One MS per preparatory batch per matrix (see box D- 7)	For matrix evaluation, use laboratory in-house LCS acceptance criteria (not to exceed 20%).	Examine the project-specific 000s. Contact the client as to additional measures to be taken,	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	None from this SDG
Matrix Spike Duplicate (MSD) or Sample Duplicate	One per preparatory batch per matrix	RPD ≤15% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	NA
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤10%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		No field dups in this SDG

Method Validated: 9056A

Initial Review by: D. Knaub Date: 10/24/14

Senior Review by: J. Hartness Date: 10/27/14

SDG#: 280-59873-1

Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between LOD and LOQ. Validator flags: If using AFCEE; Apply "F" flag		No detections between LOD and LOQ
QC Blanks (Equipment Blanks and Field Blanks)	Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B".		No EB

Data Evaluation Narrative
AMEC Project: Former Williams AFB
AMEC Project Number: 9101110001.5300.5301
Site: ST012 – Enhanced Bioremediation Field Test
Sampling Event: July 2014
Matrix: Groundwater

SDG: 550-28463-1

1.0 INTRODUCTION

A data quality evaluation (DQE) was performed on the data reported for the Enhanced Bioremediation Field Test conducted at Site ST012 in July 2014 at the former Williams Air Force Base (WAFB), located in Mesa, Arizona. The following sections provide summary discussions of the required data qualifications for each site and analytical methods for samples collected at the former WAFB. Data validation was conducted on 100% of the primary samples and field quality control samples (rinsate blanks and laboratory control sample/laboratory control sample duplicate [LCS/LCSD] samples). Data validation was performed using supplemental checklists to review the following quality control elements. A Level II DQE was performed on the analyses using the following criteria: laboratory case narrative, sample documentation, chain-of-custody, holding time protocols, method blank results, laboratory control sample (LCS) results, surrogate recoveries (where applicable), method sensitivity, and completeness.

Data was reviewed using precision and accuracy control limits presented in The Department of Defense (DoD) Quality Systems Manual (QSM) Version 4.2 (DoD, 2010). DQE data qualifications were applied if necessary in accordance with procedures in Air Force Center for Environmental Excellence (AFCEE) Quality Assurance Project Plan (QAPP), Version 4.0.01 (AFCEE, 2005), the method, and professional judgment using the following qualifiers:

J = The reported concentration is considered an estimated value due to discrepancies in meeting certain analyte-specific quality control criteria.
F = The reported concentration is between the reporting limit (RL) and method detection limit (MDL) and is considered an estimated value
UJ = The target compound was not detected and the reporting limit is considered imprecise due to discrepancies in meeting certain analyte-specific quality control criteria.
B = The result may be biased high or a false positive based on blank data.
M = The reported concentration is estimated due to matrix effects.
R = The data are considered unusable due to discrepancies in meeting certain quality control criteria and may not be used in decision making.

2.0 DELIVERABLES

The data packages as submitted to AMEC Environment and Infrastructure, Inc. (AMEC) are complete as stipulated in the Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) for Site ST012 Enhanced Bioremediation Field Test Plan (AMEC, 2014), and the applicable guidelines described in the former Williams AFB Performance Based Remediation Program QAPP and standard operating procedures (SOPs) (collectively referred to as the QAPP/SOP [AMEC, 2012]) for U.S. States Environmental Protection Agency (EPA) Methods 200.7, 300.0, SM2340B, SM2540C, and SM1030F.

3.0 SAMPLE INTEGRITY

Samples within this sample delivery group (SDG), collected from ST012, were submitted to TestAmerica Laboratories (TAL) in Phoenix, Arizona. The samples were submitted for calcium, magnesium, potassium, and sodium by USEPA Method E200.7, bromide and sulfate by USEPA Method E300.0, bicarbonate, carbonate, hydroxide, phenolphthalein, and total alkalinity by Method SM2320B, and total dissolved solids by Method SM2540C. Anion/cation balance for each sample was also determined by Method SM1030F (meq).

Based on the information provided on the cooler receipt forms, samples arrived at the laboratory within temperature and preservation requirements. Completed COC documents are included in the data package.

4.0 SAMPLE IDENTIFICATION

This SDG contains the following water and quality control (QC) samples:

Site: ST012	QC Samples
ST012-W11-NABRSOL	ST012-DUP01-072214
ST012-W11-WG-072214	
ST012-W30-WG-072214	

These samples were collected on 21 and 22 July 2014. Sample ST012-DUP01-072214 is a field duplicate of sample ST012-W30-WG-072214.

5.0 SAMPLE QUALIFICATION

Only those components that required qualification of the data are presented in this narrative. All Level II components were within the QC limits; therefore, no qualification was required for the data.

6.0 CALCIUM, MAGNESIUM, POTASSIUM, AND SODIUM (EPA 200.7)

Samples collected from site ST012 were submitted for metals by USEPA Method 200.7. The sample submitted to the TAL-Phoenix laboratory was analyzed for total calcium, magnesium,

potassium, and sodium. A Level II validation was performed on this method and all components were within the SAP/TAL SOP criteria.

6.1 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of metals by USEPA Method 200.7 with the exception of analytes that required dilution. All samples in this SDG required dilution for potassium resulting in elevated LOQs. The laboratory indicated a dilution with a "D1" qualifier which was subsequently removed during the validation process.

7.0 BROMIDE AND SULFATE (EPA 300.0)

Samples collected from site ST012 were submitted for bromide and sulfate by Method E300.0. A Level II validation was performed on this method and all components were within the QAPP/SOP criteria.

7.1 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of bromide and sulfate by USEPA Method E300.0 with the exception of analytes that required dilution. All samples in this SDG required dilution for bromide and sulfate resulting in elevated LOQs.

8.0 BICARBONATE, CARBONATE, HYDROXIDE, PHENOLPHTHALEIN, AND TOTAL ALKALINITY (SM2320B)

Samples collected from site ST012 were submitted for bicarbonate, carbonate, hydroxide, phenolphthalein, and total alkalinity by Method SM2320B. A Level II validation was performed on this method and all components were within the QAPP/SOP criteria.

9.0 TOTAL DISSOLVED SOLIDS (SM2540C)

Samples collected from site ST012 were submitted for total dissolved solids by Method SM2540C. A Level II validation was performed on this method and all components were within the QAPP/SOP criteria.

9.1 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of total dissolved solids by USEPA Method SM2540C with the exception of analytes that required dilution. All samples in this SDG required dilution for total dissolved solids resulting in elevated LOQs. The laboratory indicated a dilution with a "D2" qualifier which was subsequently removed during the validation process.

10.0 OVERALL SITE EVALUATION AND PROFESSIONAL JUDGMENT FLAGGING CHANGES

Edits to the DQE qualifiers by professional judgment were not required, and the data are usable as qualified in this data narrative.

11.0 SUMMARY OF DATA QUALITY INDICATORS

This section provides an assessment of the data based on project data quality indicators (DQIs) described on QAPP Worksheet #37 of the QAPP/SOP (AMEC, 2012). The DQIs consist of precision, accuracy, representativeness, comparability, completeness, and sensitivity.

11.1 Precision

An assessment of precision of analytical data is accomplished via review of field duplicate and MS/MSD analyses. Field duplicate and MS/MSD analyses are used to assess field variability, which includes sample collection/handling as well as matrix homogeneity. Precision is expressed as the relative percent difference (RPD) between results for duplicate pairs.

A field duplicate was analyzed for all methods list above in this SDG. Duplicate precision for each method was within QC limits, therefore, overall method and sample matrix precision are acceptable and achieve project objectives.

11.2 Accuracy (Bias)

An assessment of accuracy of analytical data is accomplished via evaluation of the spike recoveries in the MS/MSD, LCS, post digestion spike samples, and surrogate spike compounds, in addition to calibration criteria. Accuracy is expressed as percent recovery. Accuracy data were compliant with the program document QAPP/SOP, as all associated LCS/LCSD recoveries were within control. Therefore, the data results indicate method and matrix accuracy is acceptable to achieve project objectives.

11.3 Representativeness

Representativeness for the analytical data is determined through evaluation of the associated blank data and evaluation of appropriate sample handling procedures. All samples were properly stored and preserved in the field and at TestAmerica and blanks were all non-detect. The analytical results indicate sample data are representative of the Site conditions.

11.4 Comparability

Comparability addresses the confidence with which one data set can be compared to another. Use of appropriate sampling methods, COC procedures, and EPA-approved analytical methods, as well as adherence to strict QA/QC procedures, provide the basis for uniformity in sample collection and analysis. Analytical data were generated by TestAmerica using standard reporting units of milligrams per liter and methods for all parameters. In addition, sample collection and analytical method protocols were implemented in accordance with approved,

documented procedures. Analytical data are determined to be comparable to previous Site results.

11.5 Completeness

Completeness of the field sampling activities were assessed in terms of the actual number and type of sample results received from the field and laboratory, as compared with the planned number and type of sample results. All samples planned were collected which meets a field completeness of 100%.

Analytical completeness of data is a measure of the number of valid project-specific data results obtained in comparison to the total number of data results projected to achieve project DQOs. Valid data are defined as data that meet the project-specific DQOs. No data were rejected as a result of the data validation. The completeness goals met the 90 percent goal for field and laboratory data expected for this project.

11.6 Sensitivity

Analytical methods and LOQs were implemented in accordance with the QAPP/SOP and EPA promulgated methodologies. Method RLs were achieved for the event except when sample dilutions were required to bring target compounds within the linear range of the instrument calibration. These include modified RLs for selected detections. Although the laboratory RLs for samples requiring dilution exceed the QAPP RLs, sensitivity requirements were met.

11.7 Usability Summary

The data generated during the July 2014 sampling event did not require qualification and the analytical results indicate sample data is representative of the Site conditions. The DQOs for the Enhanced Bioremediation Field Test is to produce data to support design of anaerobic methods for the ST012 remedy if selected.

12.0 REFERENCES

AFCEE, 2005. Quality Assurance Project Plan, Version 4.0.01, May, 2005.

AMEC, August 11, 2014. *Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) (Enhanced Bioremediation Field Test Plan) Operable Unit 2 Site ST012 - Liquid Fuels Storage Area, Former Williams Air Force Base, Mesa, Arizona*.

AMEC, February 23, 2012. *Performance Based Remediation Program Quality Assurance Project Plan (QAPP) and Standard Operating Procedures (SOPs) (QAP/SOP), Former Williams Air Force Base, Mesa, Arizona*.

DoD, 2010. Department of Defense Quality System Manual, Version 4.2 Final, October 2010.

Prepared/Date: MHA 8/14/2014
Checked/Date: DWK 8/18/2014

Flagged Data Reports

Client Sample ID: ST012-W11-WG-072214

Lab Sample ID: 550-28463-1
Matrix: Water

Date Collected: 07/22/14 12:41
Date Received: 07/22/14 16:15

AHA 7/24/14

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	55		50		mg/L			07/23/14 03:27	100
Sulfate	1000		200		mg/L			07/23/14 03:27	100

Method: 200.7 Rev 4.4 - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	570		2.0		mg/L		07/24/14 06:28	07/24/14 14:57	1
Magnesium	110		2.0		mg/L		07/24/14 06:28	07/24/14 14:57	1
Sodium	95		0.50		mg/L		07/24/14 06:28	07/24/14 14:57	1
Potassium	640	D1	5.0		mg/L		07/24/14 06:28	07/25/14 14:43	10

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Anion/Cation Balance	0.60				%			07/31/14 11:04	1
Alkalinity as CaCO3	100		6.0		mg/L			07/29/14 18:27	1
Bicarbonate Alkalinity as CaCO3	100		6.0		mg/L			07/29/14 18:27	1
Carbonate Alkalinity as CaCO3	ND		6.0		mg/L			07/29/14 18:27	1
Alkalinity, Phenolphthalein	ND		6.0		mg/L			07/29/14 18:27	1
Hydroxide Alkalinity as CaCO3	ND		6.0		mg/L			07/29/14 18:27	1
Total Dissolved Solids	4800	D2	100		mg/L			07/24/14 10:09	1

Client Sample ID: ST012-W30-WG-072214

Lab Sample ID: 550-28463-2
Matrix: Water

Date Collected: 07/22/14 09:25
Date Received: 07/22/14 16:15

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	99		50		mg/L			07/23/14 04:23	100
Sulfate	1900		200		mg/L			07/23/14 04:23	100

Method: 200.7 Rev 4.4 - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	430		2.0		mg/L		07/24/14 06:28	07/24/14 15:04	1
Magnesium	78		2.0		mg/L		07/24/14 06:28	07/24/14 15:04	1
Sodium	150		0.50		mg/L		07/24/14 06:28	07/24/14 15:04	1
Potassium	920	D1	5.0		mg/L		07/24/14 06:28	07/25/14 14:46	10

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Anion/Cation Balance	0.38				%			07/31/14 11:04	1
Alkalinity as CaCO3	220		6.0		mg/L			07/29/14 18:39	1
Bicarbonate Alkalinity as CaCO3	220		6.0		mg/L			07/29/14 18:39	1
Carbonate Alkalinity as CaCO3	ND		6.0		mg/L			07/29/14 18:39	1
Alkalinity, Phenolphthalein	ND		6.0		mg/L			07/29/14 18:39	1
Hydroxide Alkalinity as CaCO3	ND		6.0		mg/L			07/29/14 18:39	1
Total Dissolved Solids	4500	D2	100		mg/L			07/24/14 10:09	1

8/14/14

Client Sample ID: ST012-DUP01-072214

Lab Sample ID: 550-28463-3
Matrix: Water

Date Collected: 07/22/14 10:30
Date Received: 07/22/14 16:15

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	110		50		mg/L			07/23/14 05:19	100
Sulfate	1900		200		mg/L			07/23/14 05:19	100

Method: 200.7 Rev 4.4 - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	430		2.0		mg/L		07/24/14 06:28	07/24/14 15:09	1
Magnesium	77		2.0		mg/L		07/24/14 06:28	07/24/14 15:09	1
Sodium	150		0.50		mg/L		07/24/14 06:28	07/24/14 15:09	1
Potassium	900	D1	5.0		mg/L		07/24/14 06:28	07/25/14 14:49	10

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Anion/Cation Balance	-0.14				%			07/31/14 11:04	1
Alkalinity as CaCO3	220		6.0		mg/L			07/29/14 18:50	1
Bicarbonate Alkalinity as CaCO3	220		6.0		mg/L			07/29/14 18:50	1
Carbonate Alkalinity as CaCO3	ND		6.0		mg/L			07/29/14 18:50	1
Alkalinity, Phenolphthalein	ND		6.0		mg/L			07/29/14 18:50	1
Hydroxide Alkalinity as CaCO3	ND		6.0		mg/L			07/29/14 18:50	1
Total Dissolved Solids	4500	D2	100		mg/L			07/24/14 10:09	1

Client Sample ID: ST012-W11-NaBrSol

Lab Sample ID: 550-28463-4
Matrix: Water

Date Collected: 07/21/14 15:45
Date Received: 07/22/14 16:15

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	150		50		mg/L			07/23/14 07:39	100
Sulfate	2300		200		mg/L			07/23/14 07:39	100

Method: 200.7 Rev 4.4 - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	580		2.0		mg/L		07/24/14 06:28	07/24/14 15:15	1
Magnesium	110		2.0		mg/L		07/24/14 06:28	07/24/14 15:15	1
Sodium	110		0.50		mg/L		07/24/14 06:28	07/24/14 15:15	1
Potassium	1600	D1	5.0		mg/L		07/24/14 06:28	07/25/14 14:53	10

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Anion/Cation Balance	-2.0				%			07/31/14 11:04	1
Alkalinity as CaCO3	93		6.0		mg/L			07/29/14 19:02	1
Bicarbonate Alkalinity as CaCO3	93		6.0		mg/L			07/29/14 19:02	1
Carbonate Alkalinity as CaCO3	ND		6.0		mg/L			07/29/14 19:02	1
Alkalinity, Phenolphthalein	ND		6.0		mg/L			07/29/14 19:02	1
Hydroxide Alkalinity as CaCO3	ND		6.0		mg/L			07/29/14 19:02	1
Total Dissolved Solids	6500	D2	100		mg/L			07/24/14 10:09	1

Data Quality Evaluation Checklists

Method Validated: 200.7 | Initial Review by: M. Andrews | Date: 8/13/2014 | SDG#: 550-28463-1
Senior Review by: D. Knaub | Date: 8/18/2014 | Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA (METHOD 200.7)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	Level 2 NA
Method Detection Limit (MDL) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly MDL verification checks shall be performed (see box 0-18)	See 40 CFR 1368. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL verification check at higher level and set MDL higher or reconduct MDL study (see box D-18).	NA	Samples cannot be analyzed without a valid MDL.	Level 2 NA
Instrument Detection Limit (IDL) Study	At initial set-up and after significant change in instrument type, personnel, test method, or sample matrix	IDL shall be $\leq$ Limit of Detection (LOD)	NA	NA		Level 2 NA
Container, Preservation, and Holding Time	All field samples	500 ml Poly, HNO3 to pH < 2, Cool to 4oC, 180 days to analysis	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Coll. 7/21/2014 and 7/22/2014 Prep. 7/24/2014 Anal. 7/24/2014 and 7/25/2014 Temp 1.7°C

Method Validated: 200.7 | Initial Review by: M. Andrews | Date: 8/13/2014 | SDG#: 550-28463-1
Senior Review by: D. Knaub | Date: 8/18/2014 | Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA (METHOD 200.7)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Tuning	Prior to analysis of samples	Mass calibration ≤ 0.1 amu from the true value; Resolution ≤ 0.9 amu full width at 10% peak height; For stability, RSD ≤ 5% for at least four replicate analyses.	Retune instrument then reanalyze tuning solutions	Flagging criteria are not appropriate	No analysis shall be performed without a valid MS tune.	Level 2 NA
Initial calibration (ICAL) for all analytes (minimum one high standard and a calibration blank)	Daily ICAL prior to sample analysis	If more than one calibration standard is used, r ≥ 0.995.	Correct problem then repeat ICAL.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.	Level 2 NA
Second Source Calibration Verification	Once after each ICAL	Value of second source for all analytes within ± 10% of true value	Verify second source standard. Rerun second source verification. If that fails, correct problem and repeat ICAL.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	Level 2 NA
Continuing Calibration Verification (CCV)	After every 10 field samples and at the end of the analysis sequence	All analytes within ± 10% of true value	Correct problem, rerun CCV. If that fails, then repeat ICAL. Reanalyze all samples since last successful calibration verification	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q-flag to all results for the specific analyte(s) of interest in all samples since the last acceptable CCV. Validator flags: If using AFCEE; Apply "J" flag only if reanalysis cannot be performed	Problem must be corrected. Results may not be reported without a valid CCV. Flagging is only appropriate in cases where the samples cannot be reanalyzed.	Level 2 NA

Method Validated: 200.7 | Initial Review by: M. Andrews | Date: 8/13/2014 | SDG#: 550-28463-1
Senior Review by: D. Knaub | Date: 8/18/2014 | Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA (METHOD 200.7)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Low-level calibration check standard	Daily, after one-point ICAL	Within ± 20% of truevalue	Correct problem, then reanalyze	Flagging criteria are not appropriate.	No samples may be analyzed without a valid low-level calibration check standard. Low-level calibration check standard should be less than or equal to the reporting limit.	Level 2 NA
Linear dynamic range or high-level check standard	Every 6 months -	Within ±10% of expected value	NA	NA		Level 2 NA
Method Blank	One per preparatory batch	No analytes detected > ½ RL and greater than 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL (see Box D-1).	Correct problem, then see criteria in box D-1; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch	Problem must be corrected. Results may not be reported without a valid method blank. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch.	p.11 MB 550-40228/1-A All ND

Method Validated: 200.7 | Initial Review by: M. Andrews | Date: 8/13/2014 | SDG#: 550-28463-1
Senior Review by: D. Knaub | Date: 8/18/2014 | Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA (METHOD 200.7)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Calibration blank	Before beginning a sample run, after every 10 samples, and at end of the analysis sequence	No analytes detected > LOD	Correct problem. Reprep and reanalyze calibration blank. All samples following the last acceptable calibration blank must be reanalyzed	Apply B-flag to all results for specific analyte(s) in all samples associated with the blank.		Level 2 NA
Interference check solutions (ICS-A and ICS-AB)	At the beginning of an analytical run and every 12 hours	ICS-A: Absolute value of concentration for all non-spiked analytes < LOD (unless they are a verified trace impurity from one of the spiked analytes) ICS-AB: Within ±20% of expected value	Terminate analysis, locate and correct problem, reanalyze ICS, reanalyze all samples.	If corrective action fails, apply Q-flag to all results for specific analyte(s) in all samples associated with the ICS. Validator flags: If using AFCEE; Apply "M" flag		Levell II NA
Laboratory Control Sample (LCS) Containing All Analytes to be Reported	One per preparatory batch	QC acceptance criteria specified by DoD, if available; see box D-3 and Appendix G.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix G)	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch Validator flags: If using AFCEE; Apply "J" flag	Problem must be corrected. Results may not be reported without a valid LCS. Flagging is only appropriate in cases where the samples cannot be reanalyzed.	p. 11 LCS/LCSD 550-40228/2-A All ok

Method Validated: 200.7 | Initial Review by: M. Andrews | Date: 8/13/2014 | SDG#: 550-28463-1
Senior Review by: D. Knaub | Date: 8/18/2014 | Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA (METHOD 200.7)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Matrix Spike (MS)	One per preparatory batch per matrix (see box D-7)	For matrix evaluation, use QC acceptance criteria specified by DoD for LCS.	Examine the project-specific DQOs. If the matrix spike falls outside of DoD criteria, additional quality control test (dilution test and post-digestion spike addition) are required to evaluate matrix effects.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	Pg. 11 MS/MSD listed is not associated with this SDG
Matrix Spike Duplicate (MSD)	One per preparatory batch per matrix (see Box D-7)	MSD: For matrix evaluation use QC acceptance criteria specified by DoD for LCS MSD RPD < 20%	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. Validator flags: If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	See Above
Dilution test	Each preparatory batch	Five-fold dilution must agree within ± 10% of the original measurement	Perform post-digestion spike addition.	Flagging criteria are not appropriate.	Only applicable for samples with concentrations > 50 x LOQ.	NA
Post digestion spike addition	When dilution test fails or analyte concentration for all samples < 50 x LOQ	Recovery within 75-125% of (see Table B-1)	Run all associated samples in the preparatory batch by method of standard additions (MSA) or see flagging criteria.	For specific analyte(s) in the parent sample, apply J-flag of acceptance criteria are not met.	Spike addition should produce a concentration of 10 - 100 x LOQ	NA
Method of standard additions (MSA)	When matrix interference is suspected	NA	NA	NA	Document use of MSA in the case narrative.	NA
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD 20%	Qualify samples	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		ST012-Dup01-072214 = ST012-W30-WG-072214 See RPDs below – All OK

Method Validated: 200.7 | Initial Review by: M. Andrews | Date: 8/13/2014 | SDG#: 550-28463-1
Senior Review by: D. Knaub | Date: 8/18/2014 | Matrix: Groundwater

TRACE METALS ANALYSIS BY INDUCTIVELY COUPLED PLASMA (METHOD 200.7)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Results Reported Between MDL and LOQ	NA	NA	NA	Apply J-flag to all results between MDL and LOQ. Validator flags: If using AFCEE; Apply "F" flag		All ok
QC Blanks (Equipment Blanks, and Field Blanks)	Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value are qualified as estimated and flagged "B".		No equipment blank was collected.

ST012-DUP01-072214/ST012-W30-WG-072214

	Dup	Sample	RPD
Potassium	900	920	2.19%
Sodium	150	150	0%
Calcium	430	430	0%
Magnesium	77	78	1.29%

Method Validated: 9056A/300.0 | Initial Review by: M. Andrews | Date: 8/13/2014 | SDG#: 550-28463-1
Senior Review by: D. Knaub | Date: 8/18/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	ok
Limit of Detection Determination and Verification (LOD) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOD verification checks shall be performed (see box D-13)	See 40 CFR 1368. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL / LOD verification check at higher level and set MDL higher or reconduct MDL study (see box D-13).	NA	Samples cannot be analyzed without a valid MDL.	Level II
Limit of Quantitation Establishment and Verification (LOQ) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOQ verification checks shall be performed (see box D-14)	Within calibration range including low standard; within method precision and accuracy.	Re-run LOQ	NA	Samples cannot be analyzed without a valid LOQ	Level II

Method Validated: 9056A/300.0 Initial Review by: M. Andrews Date: 8/13/2014 SDG#: 550-28463-1
Senior Review by: D. Knaub Date: 8/18/2014 Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time (RT) Window Width Calculated for Each Analyte and Surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 24-hour study.	NA	NA		OK
Container, Preservation, and Holding Time	All field samples	500 ml poly, Cool to 4°C Nitrate – 48 hours Nitrite, sulfate, chloride – 28 days	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collected: 7/21/2014 and 7/22/2014 Temp: 1.7°C Bromide and Sulfate Analyzed: 7/23/2014 OK
ICAL for All Analytes (Minimum Three Standards and One Calibration Blank)	Initial calibration prior to sample analysis	R ≥ 0.995	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.	Level II
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 10% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	Level II
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL and at the beginning of the analytical shift	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift.	NA	NA		Level II

Method Validated: 9056A/300.0 Initial Review by: M. Andrews Date: 8/13/2014 SDG#: 550-28463-1
Senior Review by: D. Knaub Date: 8/18/2014 Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Midrange Continuing Calibration Verification (CCV)	After every 10 field samples and at end of the analysis sequence.	All analytes within established retention time windows and within ± 10% of true value	Correct problem then repeat CCV. If that fails, then repeat ICAL. Reanalyze all samples since last successful calibration verification.	Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification, if . reanalysis is not possible.	No samples may be analyzed until the problem has been corrected.	Level II
Method Blank	One per preparatory batch	No analytes detected > ½ RL. See box D-1.	Correct problem, then see criteria in box D-1; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	Lab: Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch. Validator; Apply "B" flag if result is less than 5x method blank.		Pg 10 Bromide and Sulfate MB 550-40119/2= ND
Laboratory Control Sample (LCS) Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	Use laboratory in-house LCS acceptance criteria (not to exceed 20%).See Box D-3.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix G)	If corrective action fails apply J-flag to specific analyte(s) in all samples in the associated preparatory batch		Pg 10 Bromide and Sulfate LCS/LCSD 550-40119/5,6 All ok

Method Validated: 9056A/300.0 | Initial Review by: M. Andrews | Date: 8/13/2014 | SDG#: 550-28463-1
Senior Review by: D. Knaub | Date: 8/18/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Matrix Spike (MS)	One MS per preparatory batch per matrix (see box D- 7)	For matrix evaluation, use laboratory in-house LCS acceptance criteria (not to exceed 20%).	Examine the project-specific 000s. Contact the client as to additional measures to be taken,	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	MS/MSD listed is not associated with this SDG
Matrix Spike Duplicate (MSD) or Sample Duplicate	One per preparatory batch per matrix	RPD 15% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	See above
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD 10%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		ST012-Dup01-072214 = ST012-W30-WG-072214 See RPDs below – All ok
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between LOD and LOQ. Validator flags: If using AFCEE; Apply "F" flag		No samples reported between LOD and LOQ
QC Blanks (Equipment Blanks and Field Blanks)	Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B".		Not collected

Method Validated: 9056A/300.0 | Initial Review by: M. Andrews | Date: 8/13/2014 | SDG#: 550-28463-1
Senior Review by: D. Knaub | Date: 8/18/2014 | Matrix: Groundwater

ST012-DUP01-072214/ST012-W30-WG-072214

	Dup	Sample	RPD
Bromide	110	99	10%
Sulfate	1900	1900	0%

LEVEL II DATA QUALITY VALIDATION RECORD

Project: Former Williams AFB – ST012 Enhanced Bio Remediation Field Test
Project No: 9101110001.5300.5301
Method: Alkalinity by SM2320B and TDS by SM2540C
Laboratory and Lot: TAL Phoenix SDG: 550-28463-1
Reviewer/Date: M. Andrews 8/13/2014 **Senior Reviewer/Date:** D. Knaub 8/18/2014

YES NO NA **COMMENTS**

Methods listed above were analyzed on water samples: ST012-W11-NABRSOL, ST012-W11-WG-072214, ST012-W30-WG-072214, and ST012-DUP01-072214

Case Narrative and COC Completeness Review

[X] **Holding times met**

Alkalinity: Bicarbonate, Carbonate, Hydroxide, and Phenolphthalein (HT = 14 days); Sampled; 7/21/2014 and 7/22/2014 Analyzed: 7/29/2014

TDS (HT = 7days); Sampled: 7/21/2014 and 7/22/2014 Analyzed: 7/24/2014

[X] **Calibration Criteria met (if applicable)**

[X] **QC Blanks Review**

Alk (all)	MB 550-40702/59=ND
TDS	MB 550-40253/1= ND

[X] **Laboratory Control Sample (LCS) recovery within limits**

Alk (all)	LCS 550-40702/58= ok
TDS	LCS/LCSD 550-40253/2,3= ok

[X] **Lab Duplicate - Field Duplicate precision goals met (20%)**

ST012-DUP01-072214/ST012-W30-WG-072214

	Dup	Sample	RPD
Alkalinity, Bicarbonate	220	220	0%
Alkalinity, Total	220	220	0%
TDS	4500	4500	0%

[X] **Matrix Spike recoveries and RPDs within limits (if applicable)**

No MS/MSD listed in this SDG

[X] **EDD Data Verification vs. Hardcopy (10% samples for each SDG)**

Data Evaluation Narrative
AMEC Project: Former Williams AFB
AMEC Project Number: 9101110001.5300.5301
Site: ST012 – Enhanced Bioremediation Field Test
Sampling Event: July 2014
Matrix: Groundwater

SDG: 550-28624-1

1.0 INTRODUCTION

A data quality evaluation (DQE) was performed on the data reported for the Enhanced Bioremediation Field Test conducted at Site ST012 in July 2014 at the former Williams Air Force Base (WAFB), located in Mesa, Arizona. The following sections provide summary discussions of the required data qualifications for each site and analytical methods for samples collected at the former WAFB. Data validation was conducted on 100% of the primary samples and field quality control samples (rinsate blanks and laboratory control sample/laboratory control sample duplicate [LCS/LCSD] samples). A Level II DQE was performed using supplemental checklists to review the following quality control elements: laboratory case narrative, sample documentation, chain-of-custody, holding time protocols, method blank results, laboratory control sample (LCS) results, surrogate recoveries (where applicable), method sensitivity, and completeness.

Data was reviewed using precision and accuracy control limits presented in The Department of Defense (DoD) Quality Systems Manual (QSM) Version 4.2 (DoD, 2010). DQE data qualifications were applied if necessary in accordance with procedures in Air Force Center for Environmental Excellence (AFCEE) Quality Assurance Project Plan (QAPP), Version 4.0.01 (AFCEE, 2005), the method, and professional judgment using the following qualifiers:

J = The reported concentration is considered an estimated value due to discrepancies in meeting certain analyte-specific quality control criteria.
F = The reported concentration is between the reporting limit (RL) and method detection limit (MDL) and is considered an estimated value
UJ = The target compound was not detected and the reporting limit is considered imprecise due to discrepancies in meeting certain analyte-specific quality control criteria.
B = The result may be biased high or a false positive based on blank data.
M = The reported concentration is estimated due to matrix effects.
R = The data are considered unusable due to discrepancies in meeting certain quality control criteria and may not be used in decision making.

2.0 DELIVERABLES

The data packages as submitted to AMEC Environment and Infrastructure, Inc. (AMEC) are complete as stipulated in the Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) for Site ST012 Enhanced Bioremediation Field Test Plan (AMEC, 2014), and the applicable guidelines described in the former Williams AFB Performance Based Remediation Program QAPP and standard operating procedures (SOPs) (collectively referred to as the QAPP/SOP [AMEC, 2012]) for U.S. States Environmental Protection Agency (EPA) Method 300.0.

3.0 SAMPLE INTEGRITY

Samples within this sample delivery group (SDG), collected from ST012, were submitted to TestAmerica Laboratories (TAL) in Phoenix, Arizona. The samples were submitted for bromide and sulfate by USEPA method E300.0.

Based on the information provided on the cooler receipt forms, samples arrived at the laboratory above temperature requirements, but the laboratory received the sample less than two hours after collection. Therefore the sample did not have time to cool to 4°C, so no samples qualifications were required. Completed COC documents are included in the data package.

4.0 SAMPLE IDENTIFICATION

This SDG contains the following water samples:

Site: ST012	
ST012-W11-WG-072414	
ST012-W30-WG-072414	

These samples were collected on 24 July 2014.

5.0 SAMPLE QUALIFICATION

Only those components that required qualification of the data are presented in this narrative. All Level II components were within the QC limits; therefore, no qualification was required for the data.

6.0 BROMIDE AND SULFATE (EPA 300.0)

Samples collected from site ST012 were submitted for metals by USEPA Method 300.0. The sample submitted to the TAL-Phoenix laboratory was analyzed for Bromide and Sulfate. A Level II validation was performed on this method and all components were within the SAP/TAL SOP criteria.

6.1 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of metals by USEPA Method 300.0 with the exception of analytes that required dilution. All samples in this SDG required dilution for Bromide and Sulfate resulting in elevated LOQs.

7.0 OVERALL SITE EVALUATION AND PROFESSIONAL JUDGMENT FLAGGING CHANGES

Edits to the DQE qualifiers by professional judgment were not required, and the data are usable as qualified in this data narrative.

8.0 SUMMARY OF DATA QUALITY INDICATORS

This section provides an assessment of the data based on project data quality indicators (DQIs) described on QAPP Worksheet #37 of the QAPP/SOP (AMEC, 2012). The DQIs consist of precision, accuracy, representativeness, comparability, completeness, and sensitivity.

8.1 Precision

An assessment of precision of analytical data is accomplished via review of field duplicate and MS/MSD analyses. Field duplicate and MS/MSD analyses are used to assess field variability, which includes sample collection/handling as well as matrix homogeneity. Precision is expressed as the relative percent difference (RPD) between results for duplicate pairs.

No field duplicate or MS/MSD samples were submitted with this SDG; however, the laboratory analyzed a sample duplicate for anions on sample ST012-W30-WG-072414. Duplicate precision for the method was within QC limits. In addition precision was also measured through the analysis of a non-project MS/MSD and a LCS/LCSD pair and precision was within the QC limits. Therefore, overall method and sample matrix precision acceptable and achieve project objectives.

8.2 Accuracy (Bias)

An assessment of accuracy of analytical data is accomplished via evaluation of the spike recoveries in the MS/MSD, LCS, post digestion spike samples, and surrogate spike compounds, in addition to calibration criteria. Accuracy is expressed as percent recovery. Accuracy data were compliant with the program document QAPP/SOP, as all associated LCS/LCSD recoveries were within control. Therefore, the data results indicate method and matrix accuracy is acceptable to achieve project objectives.

8.3 Representativeness

Representativeness for the analytical data is determined through evaluation of the associated blank data and evaluation of appropriate sample handling procedures. All samples were

properly stored and preserved in the field and at TestAmerica and blanks were all non-detect. The analytical results indicate sample data are representative of the Site conditions.

8.4 Comparability

Comparability addresses the confidence with which one data set can be compared to another. Use of appropriate sampling methods, COC procedures, and EPA-approved analytical methods, as well as adherence to strict QA/QC procedures, provide the basis for uniformity in sample collection and analysis. Analytical data were generated by TestAmerica using standard reporting units of micrograms per liter and methods for all parameters. In addition, sample collection and analytical method protocols were implemented in accordance with approved, documented procedures. Analytical data are determined to be comparable to previous Site results.

8.5 Completeness

Completeness of the field sampling activities were assessed in terms of the actual number and type of sample results received from the field and laboratory, as compared with the planned number and type of sample results. All samples planned were collected which meets a field completeness of 100%.

Analytical completeness of data is a measure of the number of valid project-specific data results obtained in comparison to the total number of data results projected to achieve project DQOs. Valid data are defined as data that meet the project-specific DQOs. No data were rejected as a result of the data validation. The completeness goals met the 90 percent goal for field and laboratory data expected for this project.

8.6 Sensitivity

Analytical methods and LOQs were implemented in accordance with the QAPP/SOP and EPA promulgated methodologies. Method RLs were achieved for the event except when sample dilutions were required to bring target compounds within the linear range of the instrument calibration. These include modified RLs for selected detections. Although the laboratory RLs for samples requiring dilution exceed the QAPP RLs, sensitivity requirements were met.

8.7 Usability Summary

The data generated during the July 2014 sampling event did not require qualification and the analytical results indicate sample data is representative of the Site conditions. The DQOs for the Enhanced Bioremediation Field Test is to produce data to support design of anaerobic methods for the ST012 remedy if selected

9.0 REFERENCES

AFCEE, 2005. Quality Assurance Project Plan, Version 4.0.01, May, 2005.

AMEC, August 11, 2014. *Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) (Enhanced Bioremediation Field Test Plan) Operable Unit 2 Site ST012 - Liquid Fuels Storage Area, Former Williams Air Force Base, Mesa, Arizona.*

AMEC, February 23, 2012. *Performance Based Remediation Program Quality Assurance Project Plan (QAPP) and Standard Operating Procedures (SOPs) (QAP/SOP), Former Williams Air Force Base, Mesa, Arizona.*

DoD, 2010. Department of Defense Quality System Manual, Version 4.2 Final, October 2010.

Prepared/Date: DLH 8/18/2014
Checked/Date: JAH 8/19/2014

Flagged Data Reports

Client Sample Results

Client: AMEC Environment & Infrastructure, Inc.
Project/Site: FWAFB ST012 EBR

TestAmerica Job ID: 550-28624-1
SDG: Project 9101110001.5300.5301

Client Sample ID: ST012-W30-WG-072414

Lab Sample ID: 550-28624-1
Date Collected: 07/24/14 09:27
Matrix: Water
Date Received: 07/24/14 12:24

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	92		50		mg/L			07/24/14 22:30	100
Sulfate	1600		200		mg/L			07/24/14 22:30	100

Client Sample ID: ST012-W11-WG-072414

Lab Sample ID: 550-28624-2
Date Collected: 07/24/14 10:41
Matrix: Water
Date Received: 07/24/14 12:24

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	39		25		mg/L			07/26/14 03:34	50
Sulfate	2000		200		mg/L			07/24/14 23:25	100

Data Quality Evaluation Checklists

Method Validated: 9056A

Initial Review by: D Howard Date: 8/18/14

Senior Review by: J. Hartness Date: 8/19/14

SDG#: 550-28624-1

Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	ok
Limit of Detection Determination and Verification (LOD) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOD verification checks shall be performed (see box D-13)	See 40 CFR 1368. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL / LOD verification check at higher level and set MDL higher or reconduct MDL study (see box D-13).	NA	Samples cannot be analyzed without a valid MDL.	Level II
Limit of Quantitation Establishment and Verification (LOQ) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOQ verification checks shall be performed (see box D-14)	Within calibration range including low standard; within method precision and accuracy.	Re-run LOQ	NA	Samples cannot be analyzed without a valid LOQ	Level II

Method Validated: 9056A

Initial Review by: D Howard Date: 8/18/14
Senior Review by: J. Hartness Date: 8/19/14

SDG#: 550-28624-1
Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time (RT) Window Width Calculated for Each Analyte and Surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 24-hour study.	NA	NA		Level II
Container, Preservation, and Holding Time	All field samples	500 ml poly, Cool to 4°C Nitrate – 48 hours Nitrite, sulfate, chloride – 28 days	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collected: 7/24/14 Temp: 12.2°C The lab received the samples the same day that they were collected; therefore the samples did not have time to cool down before the lab received them. ***No qualification is required due to sample temperature.*** Br Analyzed: 7/24/14, 7/26/14 OK SO4 Analyzed: 7/24/14 OK
ICAL for All Analytes (Minimum Three Standards and One Calibration Blank)	Initial calibration prior to sample analysis	R ≥ 0.995	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.	Level II

Method Validated: 9056A

Initial Review by: D Howard Date: 8/18/14

Senior Review by: J. Hartness Date: 8/19/14

SDG#: 550-28624-1

Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 10% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	Level II
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL and at the beginning of the analytical shift	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift.	NA	NA		Level II
Midrange Continuing Calibration Verification (CCV)	After every 10 field samples and at end of the analysis sequence.	All analytes within established retention time windows and within ± 10% of true value	Correct problem then repeat CCV. If that fails, then repeat ICAL. Reanalyze all samples since last successful calibration verification.	Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification, if . reanalysis is not possible.	No samples may be analyzed until the problem has been corrected.	Level II

Method Validated: 9056A | Initial Review by: D Howard | Date: 8/18/14 | SDG#: 550-28624-1
Senior Review by: J. Hartness | Date: 8/19/14 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Method Blank	One per preparatory batch	No analytes detected > ½ RL. See box D-1.	Correct problem, then see criteria in box D-1; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	Lab: Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch. Validator; Apply "B" flag if result is less than 5x method blank.		Pg 8, Br and SO4 MB 550-40353/2= All ND Pg 8-9, Br and SO4 MB 550-40541/2= All ND
Laboratory Control Sample (LCS) Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	Use laboratory in-house LCS acceptance criteria (not to exceed 20%).See Box D-3.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix G)	If corrective action fails apply J-flag to specific analyte(s) in all samples in the associated preparatory batch		Pg 8, Br and SO4 LCS/LCSD 550-40353/5,6 OK Pg 8-9, Br and SO4 LCS/LCSD 550-40541/5,6 OK
Matrix Spike (MS)	One MS per preparatory batch per matrix (see box D- 7)	For matrix evaluation, use laboratory in-house LCS acceptance criteria (not to exceed 20%).	Examine the project-specific 000s. Contact the client as to additional measures to be taken,	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	p. 8 , Br and SO4 550-28611-A-1 MS/MSD Non project sample. Not evaluated p. 9 550-28695-J-1 MS/MSD Non Project sample. Not evaluated

Method Validated: 9056A

Initial Review by: D Howard Date: 8/18/14

Senior Review by: J. Hartness Date: 8/19/14

SDG#: 550-28624-1

Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Matrix Spike Duplicate (MSD) or Sample Duplicate	One per preparatory batch per matrix	RPD ≤15% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	See above
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤10%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		p. 8, Lab Dup STO12-W30WG-072414 Br RPD = 0.1 SO4 RPD = 0.00007 **OK**
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between LOD and LOQ. Validator flags: If using AFCEE; Apply "F" flag		No samples reported between LOD and LOQ
QC Blanks (Equipment Blanks and Field Blanks)	Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B".		Not collected

Data Evaluation Narrative
AMEC Project: Former Williams AFB
AMEC Project Number: 9101110001.5300.5301
Site: ST012 – Enhanced Bioremediation Field Test
Sampling Event: July 2014
Matrix: Groundwater

SDG: 550-28799-1

1.0 INTRODUCTION

A data quality evaluation (DQE) was performed on the data reported for the Enhanced Bioremediation Field Test conducted at Site ST012 in July 2014 at the former Williams Air Force Base (WAFB), located in Mesa, Arizona. The following sections provide summary discussions of the required data qualifications for each site and analytical methods for samples collected at the former WAFB. Data validation was conducted on 100% of the primary samples and field quality control samples (rinsate blanks and laboratory control sample/laboratory control sample duplicate [LCS/LCSD] samples). A Level II DQE was performed using supplemental checklists to review the following quality control elements: laboratory case narrative, sample documentation, chain-of-custody, holding time protocols, method blank results, laboratory control sample (LCS) results, surrogate recoveries (where applicable), method sensitivity, and completeness.

Data was reviewed using precision and accuracy control limits presented in The Department of Defense (DoD) Quality Systems Manual (QSM) Version 4.2 (DoD, 2010). DQE data qualifications were applied if necessary in accordance with procedures in Air Force Center for Environmental Excellence (AFCEE) Quality Assurance Project Plan (QAPP), Version 4.0.01 (AFCEE, 2005), the method, and professional judgment using the following qualifiers:

J = The reported concentration is considered an estimated value due to discrepancies in meeting certain analyte-specific quality control criteria.
F = The reported concentration is between the reporting limit (RL) and method detection limit (MDL) and is considered an estimated value
UJ = The target compound was not detected and the reporting limit is considered imprecise due to discrepancies in meeting certain analyte-specific quality control criteria.
B = The result may be biased high or a false positive based on blank data.
M = The reported concentration is estimated due to matrix effects.
R = The data are considered unusable due to discrepancies in meeting certain quality control criteria and may not be used in decision making.

2.0 DELIVERABLES

The data packages as submitted to AMEC Environment and Infrastructure, Inc. (AMEC) are complete as stipulated in the Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) for Site ST012 Enhanced Bioremediation Field Test Plan (AMEC, 2014), and the applicable guidelines described in the former Williams AFB Performance Based Remediation Program QAPP and standard operating procedures (SOPs) (collectively referred to as the QAPP/SOP [AMEC, 2012]) for U.S. States Environmental Protection Agency (EPA) Method 300.0.

3.0 SAMPLE INTEGRITY

Samples within this sample delivery group (SDG), collected from ST012, were submitted to TestAmerica Laboratories (TAL) in Phoenix, Arizona. The samples were submitted for bromide and sulfate by USEPA method E300.0.

Based on the information provided on the cooler receipt forms, samples arrived at the laboratory within temperature requirements. Completed COC documents are included in the data package.

4.0 SAMPLE IDENTIFICATION

This SDG contains the following water samples:

Site: ST012	
ST012-W11-WG-072914	
ST012-W30-WG-072914	

These samples were collected on 29 July 2014.

5.0 SAMPLE QUALIFICATION

Only those components that required qualification of the data are presented in this narrative. All Level II components were within the QC limits; therefore, no qualification was required for the data.

6.0 BROMIDE AND SULFATE (EPA 300.0)

Samples collected from site ST012 were submitted for metals by USEPA Method 300.0. The sample submitted to the TAL-Phoenix laboratory was analyzed for Bromide and Sulfate. A Level II validation was performed on this method and all components were within the SAP/TAL SOP criteria.

6.1 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of metals by USEPA Method 300.0 with the exception of analytes that required dilution. All samples in this SDG required dilution for Sulfate resulting in elevated LOQs.

7.0 OVERALL SITE EVALUATION AND PROFESSIONAL JUDGMENT FLAGGING CHANGES

Edits to the DQE qualifiers by professional judgment were not required, and the data are usable as qualified in this data narrative.

8.0 SUMMARY OF DATA QUALITY INDICATORS

This section provides an assessment of the data based on project data quality indicators (DQIs) described on QAPP Worksheet #37 of the QAPP/SOP (AMEC, 2012). The DQIs consist of precision, accuracy, representativeness, comparability, completeness, and sensitivity.

8.1 Precision

An assessment of precision of analytical data is accomplished via review of field duplicate and MS/MSD analyses. Field duplicate and MS/MSD analyses are used to assess field variability, which includes sample collection/handling as well as matrix homogeneity. Precision is expressed as the relative percent difference (RPD) between results for duplicate pairs.

No associated field duplicates or MS/MSDs were analyzed with this SDG.

8.2 Accuracy (Bias)

An assessment of accuracy of analytical data is accomplished via evaluation of the spike recoveries in the MS/MSD, LCS, post digestion spike samples, and surrogate spike compounds, in addition to calibration criteria. Accuracy is expressed as percent recovery. Accuracy data were compliant with the program document QAPP/SOP, as all associated LCS/LCSD recoveries were within control. Therefore, the data results indicate method and matrix accuracy is acceptable to achieve project objectives.

8.3 Representativeness

Representativeness for the analytical data is determined through evaluation of the associated blank data and evaluation of appropriate sample handling procedures. All samples were properly stored and preserved in the field and at TestAmerica and blanks were all non-detect. The analytical results indicate sample data are representative of the Site conditions.

8.4 Comparability

Comparability addresses the confidence with which one data set can be compared to another. Use of appropriate sampling methods, COC procedures, and EPA-approved analytical methods, as well as adherence to strict QA/QC procedures, provide the basis for uniformity in sample collection and analysis. Analytical data were generated by TestAmerica using standard reporting units of micrograms per liter and methods for all parameters. In addition, sample collection and analytical method protocols were implemented in accordance with approved, documented procedures. Analytical data are determined to be comparable to previous Site results.

8.5 Completeness

Completeness of the field sampling activities were assessed in terms of the actual number and type of sample results received from the field and laboratory, as compared with the planned number and type of sample results. All samples planned were collected which meets a field completeness of 100%.

Analytical completeness of data is a measure of the number of valid project-specific data results obtained in comparison to the total number of data results projected to achieve project DQOs. Valid data are defined as data that meet the project-specific DQOs. No data were rejected as a result of the data validation. The completeness goals met the 90 percent goal for field and laboratory data expected for this project.

8.6 Sensitivity

Analytical methods and LOQs were implemented in accordance with the QAPP/SOP and EPA promulgated methodologies. Method RLs were achieved for the event except when sample dilutions were required to bring target compounds within the linear range of the instrument calibration. These include modified RLs for selected detections. Although the laboratory RLs for samples requiring dilution exceed the QAPP RLs, sensitivity requirements were met.

8.7 Usability Summary

The data generated during the July 2014 sampling event did not require qualification and the analytical results indicate sample data is representative of the Site conditions. The DQOs for the Enhanced Bioremediation Field Test is to produce data to support design of anaerobic methods for the ST012 remedy if selected.

9.0 REFERENCES

AFCEE, 2005. Quality Assurance Project Plan, Version 4.0.01, May, 2005.

AMEC, August 11, 2014. *Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) (Enhanced Bioremediation Field Test Plan) Operable Unit 2 Site ST012 - Liquid Fuels Storage Area, Former Williams Air Force Base, Mesa, Arizona.*

AMEC, February 23, 2012. *Performance Based Remediation Program Quality Assurance Project Plan (QAPP) and Standard Operating Procedures (SOPs) (QAP/SOP), Former Williams Air Force Base, Mesa, Arizona.*

DoD, 2010. Department of Defense Quality System Manual, Version 4.2 Final, October 2010.

Prepared/Date: DLH 8/18/2014
Checked/Date: JAH 8/19/2014

Flagged Data Reports

8/18/14

Client Sample Results

Client: AMEC Environment & Infrastructure, Inc.
Project/Site: FWAFB ST012 EBR

TestAmerica Job ID: 550-28799-1
SDG: Project #910111.5300.5301

Client Sample ID: ST012-W30-WG-072914

Lab Sample ID: 550-28799-1
Matrix: Water

Date Collected: 07/29/14 09:17
Date Received: 07/29/14 13:32

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	47		25		mg/L			07/29/14 18:39	50
Sulfate	840		100		mg/L			07/29/14 18:39	50

Client Sample ID: ST012-W11-WG-072914

Lab Sample ID: 550-28799-2
Matrix: Water

Date Collected: 07/29/14 10:52
Date Received: 07/29/14 13:32

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	18		10		mg/L			07/30/14 19:50	20
Sulfate	940		100		mg/L			07/29/14 18:58	50

Data Quality Evaluation Checklists

Method Validated: 9056A

Initial Review by: D Howard Date: 8/15/14

Senior Review by: J. Hartness Date: 8/19/14

SDG#: 550-28799-1

Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	ok
Limit of Detection Determination and Verification (LOD) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOD verification checks shall be performed (see box D-13)	See 40 CFR 1368. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL / LOD verification check at higher level and set MDL higher or reconduct MDL study (see box D-13).	NA	Samples cannot be analyzed without a valid MDL.	Level II
Limit of Quantitation Establishment and Verification (LOQ) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOQ verification checks shall be performed (see box D-14)	Within calibration range including low standard; within method precision and accuracy.	Re-run LOQ	NA	Samples cannot be analyzed without a valid LOQ	Level II

Method Validated: 9056A

Initial Review by: D Howard Date: 8/15/14
Senior Review by: J. Hartness Date: 8/19/14

SDG#: 550-28799-1
Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time (RT) Window Width Calculated for Each Analyte and Surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 24-hour study.	NA	NA		OK
Container, Preservation, and Holding Time	All field samples	500 ml poly, Cool to 4°C Nitrate – 48 hours Nitrite, sulfate, chloride – 28 days	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collected: 7/29/14 Temp: 2.9°C Br Analyzed: 7/29/14, 7/30/14 OK SO4 Analyzed: 7/29/14 OK
ICAL for All Analytes (Minimum Three Standards and One Calibration Blank)	Initial calibration prior to sample analysis	R ≥ 0.995	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.	Level II
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 10% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	Level II
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL and at the beginning of the analytical shift	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift.	NA	NA		Level II

Method Validated: 9056A

Initial Review by: D Howard Date: 8/15/14

Senior Review by: J. Hartness Date: 8/19/14

SDG#: 550-28799-1

Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Midrange Continuing Calibration Verification (CCV)	After every 10 field samples and at end of the analysis sequence.	All analytes within established retention time windows and within ± 10% of true value	Correct problem then repeat CCV. If that fails, then repeat ICAL. Reanalyze all samples since last successful calibration verification.	Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification, if . reanalysis is not possible.	No samples may be analyzed until the problem has been corrected.	Level II
Method Blank	One per preparatory batch	No analytes detected > ½ RL. See box D-1.	Correct problem, then see criteria in box D-1; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	Lab: Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch. Validator; Apply "B" flag if result is less than 5x method blank.		Pg 8, Br and SO4 MB 550-40717/2= ND Pg 8, Br and SO4 MB 550-40828/2= ND
Laboratory Control Sample (LCS) Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	Use laboratory in-house LCS acceptance criteria (not to exceed 20%).See Box D-3.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix G)	If corrective action fails apply J-flag to specific analyte(s) in all samples in the associated preparatory batch		Pg 8, Br and SO4 LCS/LCSD 550-40717/5,6 OK Pg 8-9, Br and SO4 LCS/LCSD 550-40828/6,7 OK

Method Validated: 9056A

Initial Review by: D Howard Date: 8/15/14

Senior Review by: J. Hartness Date: 8/19/14

SDG#: 550-28799-1

Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Matrix Spike (MS)	One MS per preparatory batch per matrix (see box D- 7)	For matrix evaluation, use laboratory in-house LCS acceptance criteria (not to exceed 20%).	Examine the project-specific 000s. Contact the client as to additional measures to be taken,	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	p. 8 Br and SO4 550-28804-G-3MS/MSD Non project sample. Not evaluated 550-28887-B-1MS/MSD Non Project sample. Not evaluated
Matrix Spike Duplicate (MSD) or Sample Duplicate	One per preparatory batch per matrix	RPD ≤15% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	See above
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤10%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		No field duplicate collected
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between LOD and LOQ. Validator flags: If using AFCEE; Apply "F" flag		No samples reported between LOD and LOQ
QC Blanks (Equipment Blanks and Field Blanks)	Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B".		Not collected

Data Evaluation Narrative
AMEC Project: Former Williams AFB
AMEC Project Number: 9101110001.5300.5301
Site: ST012 – Enhanced Bioremediation Field Test
Sampling Event: July 2014
Matrix: Groundwater

SDG: 550-28984-1

1.0 INTRODUCTION

A data quality evaluation (DQE) was performed on the data reported for the Enhanced Bioremediation Field Test conducted at Site ST012 in July 2014 at the former Williams Air Force Base (WAFB), located in Mesa, Arizona. The following sections provide summary discussions of the required data qualifications for each site and analytical methods for samples collected at the former WAFB. Data validation was conducted on 100% of the primary samples and field quality control samples (rinsate blanks and laboratory control sample/laboratory control sample duplicate [LCS/LCSD] samples). Data validation was performed using supplemental checklists to review the following quality control elements. A Level II DQE was performed on the analyses using the following criteria: laboratory case narrative, sample documentation, chain-of-custody, holding time protocols, method blank results, laboratory control sample (LCS) results, surrogate recoveries (where applicable), method sensitivity, and completeness.

Data was reviewed using precision and accuracy control limits presented in The Department of Defense (DoD) Quality Systems Manual (QSM) Version 4.2 (DoD, 2010). DQE data qualifications were applied if necessary in accordance with procedures in Air Force Center for Environmental Excellence (AFCEE) Quality Assurance Project Plan (QAPP), Version 4.0.01 (AFCEE, 2005), the method, and professional judgment using the following qualifiers:

J = The reported concentration is considered an estimated value due to discrepancies in meeting certain analyte-specific quality control criteria.
F = The reported concentration is between the reporting limit (RL) and method detection limit (MDL) and is considered an estimated value
UJ = The target compound was not detected and the reporting limit is considered imprecise due to discrepancies in meeting certain analyte-specific quality control criteria.
B = The result may be biased high or a false positive based on blank data.
M = The reported concentration is estimated due to matrix effects.
R = The data are considered unusable due to discrepancies in meeting certain quality control criteria and may not be used in decision making.

2.0 DELIVERABLES

The data packages as submitted to AMEC Environment and Infrastructure, Inc. (AMEC) are complete as stipulated in the Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) for Site ST012 Enhanced Bioremediation Field Test Plan (AMEC, 2014), and the applicable guidelines described in the former Williams AFB Performance Based Remediation Program QAPP and standard operating procedures (SOPs) (collectively referred to as the QAPP/SOP [AMEC, 2012]) for U.S. States Environmental Protection Agency (EPA) Method 300.0.

3.0 SAMPLE INTEGRITY

Samples within this sample delivery group (SDG), collected from ST012, were submitted to TestAmerica Laboratories (TAL) in Phoenix, Arizona. The samples were submitted for bromide and sulfate by USEPA Method E300.0.

Based on the information provided on the cooler receipt forms, samples arrived at the laboratory within temperature and preservation requirements. Completed COC documents are included in the data package.

4.0 SAMPLE IDENTIFICATION

This SDG contains the following water and quality control (QC) samples:

Site: ST012	QC Samples
ST012-W11-WG-073114	
ST012-W30-WG-073114	

These samples were collected on 31 July 2014.

5.0 SAMPLE QUALIFICATION

Only those components that required qualification of the data are presented in this narrative. All Level II components were within the QC limits; therefore, no qualification was required for the data.

6.0 BROMIDE AND SULFATE (EPA 300.0)

Samples collected from site ST012 were submitted for bromide and sulfate by Method E300.0. A Level II validation was performed on this method and all components were within the QAPP/SOP criteria.

6.1 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of bromide and sulfate by USEPA Method E300.0 with the exception of analytes that

required dilution. Each of the samples reported in this SDG required dilution for bromide and sulfate resulting in elevated LOQs.

7.0 OVERALL SITE EVALUATION AND PROFESSIONAL JUDGMENT FLAGGING CHANGES

Edits to the DQE qualifiers by professional judgment were not required, and the data are usable as qualified in this data narrative.

8.0 SUMMARY OF DATA QUALITY INDICATORS

This section provides an assessment of the data based on project data quality indicators (DQIs) described on QAPP Worksheet #37 of the QAPP/SOP (AMEC, 2012). The DQIs consist of precision, accuracy, representativeness, comparability, completeness, and sensitivity.

8.1 Precision

An assessment of precision of analytical data is accomplished via review of field duplicate and MS/MSD analyses. Field duplicate and MS/MSD analyses are used to assess field variability, which includes sample collection/handling as well as matrix homogeneity. Precision is expressed as the relative percent difference (RPD) between results for duplicate pairs.

No field duplicate or project specific samples were submitted for MS/MSD analyses in the SDG; however, the laboratory analyzed a LCS/LCSD and a MS/MSD on a non-project sample for batch precision. Duplicate precision for anions was within QC limits, therefore, overall method and sample matrix precision are acceptable and achieve project objectives.

8.2 Accuracy (Bias)

An assessment of accuracy of analytical data is accomplished via evaluation of the spike recoveries in the MS/MSD, LCS, post digestion spike samples, and surrogate spike compounds, in addition to calibration criteria. Accuracy is expressed as percent recovery. Accuracy data were compliant with the program document QAPP/SOP, as all associated LCS/LCSD recoveries were within control. Therefore, the data results indicate method and matrix accuracy is acceptable to achieve project objectives.

8.3 Representativeness

Representativeness for the analytical data is determined through evaluation of the associated blank data and evaluation of appropriate sample handling procedures. All samples were properly stored and preserved in the field and at TestAmerica and blanks were all non-detect. The analytical results indicate sample data are representative of the Site conditions.

8.4 Comparability

Comparability addresses the confidence with which one data set can be compared to another. Use of appropriate sampling methods, COC procedures, and EPA-approved analytical methods, as well as adherence to strict QA/QC procedures, provide the basis for uniformity in sample collection and analysis. Analytical data were generated by TestAmerica using standard reporting units of milligrams per liter and methods for all parameters. In addition, sample collection and analytical method protocols were implemented in accordance with approved, documented procedures. Analytical data are determined to be comparable to previous Site results.

8.5 Completeness

Completeness of the field sampling activities were assessed in terms of the actual number and type of sample results received from the field and laboratory, as compared with the planned number and type of sample results. All samples planned were collected which meets a field completeness of 100%.

Analytical completeness of data is a measure of the number of valid project-specific data results obtained in comparison to the total number of data results projected to achieve project DQOs. Valid data are defined as data that meet the project-specific DQOs. No data were rejected as a result of the data validation. The completeness goals met the 90 percent goal for field and laboratory data expected for this project.

8.6 Sensitivity

Analytical methods and LOQs were implemented in accordance with the QAPP/SOP and EPA promulgated methodologies. Method RLs were achieved for the event except when sample dilutions were required to bring target compounds within the linear range of the instrument calibration. These include modified RLs for selected detections. Although the laboratory RLs for samples requiring dilution exceed the QAPP RLs, sensitivity requirements were met.

8.7 Usability Summary

The data generated during the July 2014 sampling event did not require qualification and the analytical results indicate sample data is representative of the Site conditions. The DQOs for the Enhanced Bioremediation Field Test is to produce data to support design of anaerobic methods for the ST012 remedy if selected.

9.0 REFERENCES

AFCEE, 2005. Quality Assurance Project Plan, Version 4.0.01, May, 2005.

AMEC, August 11, 2014. *Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) (Enhanced Bioremediation Field Test Plan) Operable Unit 2 Site ST012 - Liquid Fuels Storage Area, Former Williams Air Force Base, Mesa, Arizona*.

AMEC, February 23, 2012. *Performance Based Remediation Program Quality Assurance Project Plan (QAPP) and Standard Operating Procedures (SOPs) (QAP/SOP), Former Williams Air Force Base, Mesa, Arizona*.

DoD, 2010. Department of Defense Quality System Manual, Version 4.2 Final, October 2010.

Prepared/Date: JAH 8/26/2014
Checked/Date: DWK 8/28/2014

Flagged Data Reports

Client Sample ID: ST012-W11-WG-073114
Date Collected: 07/31/14 12:38
Date Received: 07/31/14 15:49

Lab Sample ID: 550-28984-1
Matrix: Water

Nr flag 9-26-14

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	12		10		mg/L			08/01/14 01:01	20
Sulfate	610		40		mg/L			08/01/14 01:01	20

Client Sample ID: ST012-W30-WG-073114
Date Collected: 07/31/14 10:43
Date Received: 07/31/14 15:49

Lab Sample ID: 550-28984-2
Matrix: Water

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	35		10		mg/L			08/01/14 01:19	20
Sulfate	660		40		mg/L			08/01/14 01:19	20

Data Quality Evaluation Checklists

Method Validated: 300.0 | Initial Review by: J. Hartness | Date: 8/26/2014 | SDG#: 550-28984-1
Senior Review by: D. Knaub | Date: 8/28/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	ok
Limit of Detection Determination and Verification (LOD) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOD verification checks shall be performed (see box D-13)	See 40 CFR 1368. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL / LOD verification check at higher level and set MDL higher or reconduct MDL study (see box D-13).	NA	Samples cannot be analyzed without a valid MDL.	Level II
Limit of Quantitation Establishment and Verification (LOQ) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOQ verification checks shall be performed (see box D-14)	Within calibration range including low standard; within method precision and accuracy.	Re-run LOQ	NA	Samples cannot be analyzed without a valid LOQ	Level II

Method Validated: 300.0 Initial Review by: J. Hartness Date: 8/26/2014 SDG#: 550-28984-1
Senior Review by: D. Knaub Date: 8/28/2014 Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time (RT) Window Width Calculated for Each Analyte and Surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 24-hour study.	NA	NA		Level II
Container, Preservation, and Holding Time	All field samples	500 ml poly, Cool to 4°C Nitrate – 48 hours Nitrite, sulfate, chloride – 28 days	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collected: 7/31/2014 Temp: 1.2°C Bromide and Sulfate Analyzed: 8/01/2014 OK
ICAL for All Analytes (Minimum Three Standards and One Calibration Blank)	Initial calibration prior to sample analysis	$R \geq 0.995$	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.	Level II
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 10% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	Level II
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL and at the beginning of the analytical shift	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift.	NA	NA		Level II

Method Validated: 300.0 | Initial Review by: J. Hartness | Date: 8/26/2014 | SDG#: 550-28984-1
Senior Review by: D. Knaub | Date: 8/28/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Midrange Continuing Calibration Verification (CCV)	After every 10 field samples and at end of the analysis sequence.	All analytes within established retention time windows and within ± 10% of true value	Correct problem then repeat CCV. If that fails, then repeat ICAL. Reanalyze all samples since last successful calibration verification.	Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification, if . reanalysis is not possible.	No samples may be analyzed until the problem has been corrected.	Level II
Method Blank	One per preparatory batch	No analytes detected > ½ RL. See box D-1.	Correct problem, then see criteria in box D-1; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	Lab: Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch. Validator; Apply "B" flag if result is less than 5x method blank.		Pg 8 Bromide and Sulfate MB 550-40926/2= ND
Laboratory Control Sample (LCS) Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	Use laboratory in-house LCS acceptance criteria (not to exceed 20%).See Box D-3.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix G)	If corrective action fails apply J-flag to specific analyte(s) in all samples in the associated preparatory batch		Pg 8 Bromide and Sulfate LCS/LCSD 550-40926/5,6 All ok

Method Validated: 300.0 | Initial Review by: J. Hartness | Date: 8/26/2014 | SDG#: 550-28984-1
Senior Review by: D. Knaub | Date: 8/28/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Matrix Spike (MS)	One MS per preparatory batch per matrix (see box D- 7)	For matrix evaluation, use laboratory in-house LCS acceptance criteria (not to exceed 20%).	Examine the project-specific 000s. Contact the client as to additional measures to be taken,	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	MS/MSD listed is not associated with this SDG
Matrix Spike Duplicate (MSD) or Sample Duplicate	One per preparatory batch per matrix	RPD ≤15% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	See above
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤10%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		No field duplicates submitted with this SDG
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between LOD and LOQ. Validator flags: If using AFCEE; Apply "F" flag		No samples reported between LOD and LOQ
QC Blanks (Equipment Blanks and Field Blanks)	Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B".		Not collected

Data Evaluation Narrative
AMEC Project: Former Williams AFB
AMEC Project Number: 9101110001.5300.5301
Site: ST012 – Enhanced Bioremediation Field Test
Sampling Event: August 2014
Matrix: Groundwater

SDG: 550-29160-1

1.0 INTRODUCTION

A data quality evaluation (DQE) was performed on the data reported for the Enhanced Bioremediation field test conducted at Site ST012 in August 2014 at the former Williams Air Force Base (WAFB), located in Mesa, Arizona. The following sections provide summary discussions of the required data qualifications for each site and analytical methods for samples collected at the former WAFB. Data validation was conducted on 100% of the primary samples and field quality control samples (rinsate blanks and laboratory control sample/laboratory control sample duplicate [LCS/LCSD] samples). Data validation was performed using supplemental checklists to review the following quality control elements. A Level II DQE was performed on the analyses using the following criteria: laboratory case narrative, sample documentation, chain-of-custody, holding time protocols, method blank results, laboratory control sample (LCS) results, surrogate recoveries (where applicable), method sensitivity, and completeness.

Data was reviewed using precision and accuracy control limits presented in The Department of Defense (DoD) Quality Systems Manual (QSM) Version 4.2 (DoD, 2010). DQE data qualifications were applied if necessary in accordance with procedures in Air Force Center for Environmental Excellence (AFCEE) Quality Assurance Project Plan (QAPP), Version 4.0.01 (AFCEE, 2005), the method, and professional judgment using the following qualifiers:

J = The reported concentration is considered an estimated value due to discrepancies in meeting certain analyte-specific quality control criteria.
F = The reported concentration is between the reporting limit (RL) and method detection limit (MDL) and is considered an estimated value
UJ = The target compound was not detected and the reporting limit is considered imprecise due to discrepancies in meeting certain analyte-specific quality control criteria.
B = The result may be biased high or a false positive based on blank data.
M = The reported concentration is estimated due to matrix effects.
R = The data are considered unusable due to discrepancies in meeting certain quality control criteria and may not be used in decision making.

2.0 DELIVERABLES

The data packages as submitted to AMEC Environment and Infrastructure, Inc. (AMEC) are complete as stipulated in the Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) for Site ST012 Enhanced Bioremediation Field Test Plan (AMEC, 2014), and the applicable guidelines described in the former Williams AFB Performance Based Remediation Program QAPP and standard operating procedures (SOPs) (collectively referred to as the QAPP/SOP [AMEC, 2012]) for U.S. States Environmental Protection Agency (EPA) Method 300.0.

3.0 SAMPLE INTEGRITY

Samples within this sample delivery group (SDG), collected from ST012, were submitted to TestAmerica Laboratories (TAL) in Phoenix, Arizona. The samples were submitted for bromide and sulfate by USEPA Method E300.0.

Based on the information provided on the cooler receipt forms, samples arrived at the laboratory within temperature and preservation requirements. Completed COC documents are included in the data package.

4.0 SAMPLE IDENTIFICATION

This SDG contains the following water and quality control (QC) samples:

Site: ST012	QC Samples
ST012-W11-WG-080514	
ST012-W30-WG-080514	

These samples were collected on 8 August 2014.

5.0 SAMPLE QUALIFICATION

Only those components that required qualification of the data are presented in this narrative. All Level II components were within the QC limits; therefore, no qualification was required for the data.

6.0 BROMIDE AND SULFATE (EPA 300.0)

Samples collected from site ST012 were submitted for bromide and sulfate by Method E300.0. A Level II validation was performed on this method and all components were within the QAPP/SOP criteria.

6.1 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of bromide and sulfate by USEPA Method E300.0 with the exception of analytes that

required dilution. Each of the samples reported in this SDG required dilution for bromide and sulfate resulting in elevated LOQs.

7.0 OVERALL SITE EVALUATION AND PROFESSIONAL JUDGMENT FLAGGING CHANGES

Edits to the DQE qualifiers by professional judgment were not required, and the data are usable as qualified in this data narrative.

8.0 SUMMARY OF DATA QUALITY INDICATORS

This section provides an assessment of the data based on project data quality indicators (DQIs) described on QAPP Worksheet #37 of the QAPP/SOP (AMEC, 2012). The DQIs consist of precision, accuracy, representativeness, comparability, completeness, and sensitivity.

8.1 Precision

An assessment of precision of analytical data is accomplished via review of field duplicate and MS/MSD analyses. Field duplicate and MS/MSD analyses are used to assess field variability, which includes sample collection/handling as well as matrix homogeneity. Precision is expressed as the relative percent difference (RPD) between results for duplicate pairs.

No field duplicate or project specific samples were submitted for MS/MSD analyses in the SDG; however, the laboratory analyzed a LCS/LCSD and a MS/MSD on a non-project sample for batch precision. Duplicate precision for anions was within QC limits, therefore, overall method and sample matrix precision are acceptable and achieve project objectives.

8.2 Accuracy (Bias)

An assessment of accuracy of analytical data is accomplished via evaluation of the spike recoveries in the MS/MSD, LCS, post digestion spike samples, and surrogate spike compounds, in addition to calibration criteria. Accuracy is expressed as percent recovery. Accuracy data were compliant with the program document QAPP/SOP, as all associated LCS/LCSD recoveries were within control. Therefore, the data results indicate method and matrix accuracy is acceptable to achieve project objectives.

8.3 Representativeness

Representativeness for the analytical data is determined through evaluation of the associated blank data and evaluation of appropriate sample handling procedures. All samples were properly stored and preserved in the field and at TestAmerica and blanks were all non-detect. The analytical results indicate sample data are representative of the Site conditions.

8.4 Comparability

Comparability addresses the confidence with which one data set can be compared to another. Use of appropriate sampling methods, COC procedures, and EPA-approved analytical methods, as well as adherence to strict QA/QC procedures, provide the basis for uniformity in sample collection and analysis. Analytical data were generated by TestAmerica using standard reporting units of milligrams per liter and methods for all parameters. In addition, sample collection and analytical method protocols were implemented in accordance with approved, documented procedures. Analytical data are determined to be comparable to previous Site results.

8.5 Completeness

Completeness of the field sampling activities were assessed in terms of the actual number and type of sample results received from the field and laboratory, as compared with the planned number and type of sample results. All samples planned were collected which meets a field completeness of 100%.

Analytical completeness of data is a measure of the number of valid project-specific data results obtained in comparison to the total number of data results projected to achieve project DQOs. Valid data are defined as data that meet the project-specific DQOs. No data were rejected as a result of the data validation. The completeness goals met the 90 percent goal for field and laboratory data expected for this project.

8.6 Sensitivity

Analytical methods and LOQs were implemented in accordance with the QAPP/SOP and EPA promulgated methodologies. Method RLs were achieved for the event except when sample dilutions were required to bring target compounds within the linear range of the instrument calibration. These include modified RLs for selected detections. Although the laboratory RLs for samples requiring dilution exceed the QAPP RLs, sensitivity requirements were met.

8.7 Usability Summary

The data generated during the August 2014 sampling event did not require qualification and the analytical results indicate sample data is representative of the Site conditions. The DQOs for the Enhanced Bioremediation Field Test is to produce data to support design of anaerobic methods for the ST012 remedy if selected.

9.0 REFERENCES

AFCEE, 2005. Quality Assurance Project Plan, Version 4.0.01, May, 2005.

AMEC, August 11, 2014. *Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) (Enhanced Bioremediation Field Test Plan) Operable Unit 2 Site ST012 - Liquid Fuels Storage Area, Former Williams Air Force Base, Mesa, Arizona.*

AMEC, February 23, 2012. *Performance Based Remediation Program Quality Assurance Project Plan (QAPP) and Standard Operating Procedures (SOPs) (QAP/SOP), Former Williams Air Force Base, Mesa, Arizona.*

DoD, 2010. Department of Defense Quality System Manual, Version 4.2 Final, October 2010.

Prepared/Date: JAH 8/26/2014
Checked/Date: DWK 8/28/2014

Flagged Data Reports

Client: AMEC Environment & Infrastructure, Inc.
Project/Site: Williams AFB ST012 ERB Field Test

TestAmerica Job ID: 550-29160-1

No flags QA 9-26-14

Client Sample ID: ST012-W30-WG-080514
Date Collected: 08/05/14 08:13
Date Received: 08/05/14 12:09

Lab Sample ID: 550-29160-1
Matrix: Water

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	20		10		mg/L			08/05/14 20:26	20
Sulfate	320		40		mg/L			08/05/14 20:26	20

Client Sample ID: ST012-W11-WG-080514
Date Collected: 08/05/14 09:18
Date Received: 08/05/14 12:09

Lab Sample ID: 550-29160-2
Matrix: Water

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	6.2		0.50		mg/L			08/06/14 20:32	1
Sulfate	300		40		mg/L			08/05/14 20:44	20

Data Quality Evaluation Checklists

Method Validated: 300.0 | Initial Review by: J. Hartness | Date: 8/26/2014 | SDG#: 550-29160-1
Senior Review by: D. Knaub | Date: 8/28/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	ok
Limit of Detection Determination and Verification (LOD) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOD verification checks shall be performed (see box D-13)	See 40 CFR 1368. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL / LOD verification check at higher level and set MDL higher or reconduct MDL study (see box D-13).	NA	Samples cannot be analyzed without a valid MDL.	Level II
Limit of Quantitation Establishment and Verification (LOQ) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOQ verification checks shall be performed (see box D-14)	Within calibration range including low standard; within method precision and accuracy.	Re-run LOQ	NA	Samples cannot be analyzed without a valid LOQ	Level II

Method Validated: 300.0 | Initial Review by: J. Hartness | Date: 8/26/2014 | SDG#: 550-29160-1
Senior Review by: D. Knaub | Date: 8/28/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time (RT) Window Width Calculated for Each Analyte and Surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 24-hour study.	NA	NA		Level II
Container, Preservation, and Holding Time	All field samples	500 ml poly, Cool to 4°C Nitrate – 48 hours Nitrite, sulfate, chloride – 28 days	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collected: 8/05/2014 Temp: 0.8°C Bromide and Sulfate Analyzed: 8/05/2014 and 8/06/2014 OK
ICAL for All Analytes (Minimum Three Standards and One Calibration Blank)	Initial calibration prior to sample analysis	R ≥ 0.995	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.	Level II
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 10% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	Level II
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL and at the beginning of the analytical shift	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift.	NA	NA		Level II

Method Validated: 300.0 | Initial Review by: J. Hartness | Date: 8/26/2014 | SDG#: 550-29160-1
Senior Review by: D. Knaub | Date: 8/28/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Midrange Continuing Calibration Verification (CCV)	After every 10 field samples and at end of the analysis sequence.	All analytes within established retention time windows and within ± 10% of true value	Correct problem then repeat CCV. If that fails, then repeat ICAL. Reanalyze all samples since last successful calibration verification.	Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification, if . reanalysis is not possible.	No samples may be analyzed until the problem has been corrected.	Level II
Method Blank	One per preparatory batch	No analytes detected > ½ RL. See box D-1.	Correct problem, then see criteria in box D-1; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	Lab: Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch. Validator; Apply "B" flag if result is less than 5x method blank.		Pg 8 Bromide and Sulfate MB 550-41231/2= ND MB 550-41356/2= ND
Laboratory Control Sample (LCS) Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	Use laboratory in-house LCS acceptance criteria (not to exceed 20%).See Box D-3.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix G)	If corrective action fails apply J-flag to specific analyte(s) in all samples in the associated preparatory batch		Pg 8 Bromide and Sulfate LCS/LCSD 550-41231/5,6 All ok Pg 8-9 LCS/LCSD 550-41356/5,6 All ok

Method Validated: 300.0 | Initial Review by: J. Hartness | Date: 8/26/2014 | SDG#: 550-29160-1
Senior Review by: D. Knaub | Date: 8/28/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Matrix Spike (MS)	One MS per preparatory batch per matrix (see box D- 7)	For matrix evaluation, use laboratory in-house LCS acceptance criteria (not to exceed 20%).	Examine the project-specific 000s. Contact the client as to additional measures to be taken,	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	MS/MSD listed is not associated with this SDG
Matrix Spike Duplicate (MSD) or Sample Duplicate	One per preparatory batch per matrix	RPD ≤15% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	See above
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤10%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		No field duplicates submitted with this SDG
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between LOD and LOQ. Validator flags: If using AFCEE; Apply "F" flag		No samples reported between LOD and LOQ
QC Blanks (Equipment Blanks and Field Blanks)	Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B".		Not collected

Data Evaluation Narrative
AMEC Project: Former Williams AFB
AMEC Project Number: 9101110001.5300.5301
Site: ST012 – Enhanced Bioremediation Field Test
Sampling Event: August 2014
Matrix: Groundwater

SDG: 550-29406-1

1.0 INTRODUCTION

A data quality evaluation (DQE) was performed on the data reported for the Enhanced Bioremediation field test conducted at Site ST012 in August 2014 at the former Williams Air Force Base (WAFB), located in Mesa, Arizona. The following sections provide summary discussions of the required data qualifications for each site and analytical methods for samples collected at the former WAFB. Data validation was conducted on 100% of the primary samples and field quality control samples (rinsate blanks and laboratory control sample/laboratory control sample duplicate [LCS/LCSD] samples). Data validation was performed using supplemental checklists to review the following quality control elements. A Level II DQE was performed on the analyses using the following criteria: laboratory case narrative, sample documentation, chain-of-custody, holding time protocols, method blank results, laboratory control sample (LCS) results, surrogate recoveries (where applicable), method sensitivity, and completeness.

Data was reviewed using precision and accuracy control limits presented in The Department of Defense (DoD) Quality Systems Manual (QSM) Version 4.2 (DoD, 2010). DQE data qualifications were applied if necessary in accordance with procedures in Air Force Center for Environmental Excellence (AFCEE) Quality Assurance Project Plan (QAPP), Version 4.0.01 (AFCEE, 2005), the method, and professional judgment using the following qualifiers:

J = The reported concentration is considered an estimated value due to discrepancies in meeting certain analyte-specific quality control criteria.
F = The reported concentration is between the reporting limit (RL) and method detection limit (MDL) and is considered an estimated value
UJ = The target compound was not detected and the reporting limit is considered imprecise due to discrepancies in meeting certain analyte-specific quality control criteria.
B = The result may be biased high or a false positive based on blank data.
M = The reported concentration is estimated due to matrix effects.
R = The data are considered unusable due to discrepancies in meeting certain quality control criteria and may not be used in decision making.

2.0 DELIVERABLES

The data packages as submitted to AMEC Environment and Infrastructure, Inc. (AMEC) are complete as stipulated in the Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) for Site ST012 Enhanced Bioremediation Field Test Plan (AMEC, 2014), and the applicable guidelines described in the former Williams AFB Performance Based Remediation Program QAPP and standard operating procedures (SOPs) (collectively referred to as the QAPP/SOP [AMEC, 2012]) for U.S. States Environmental Protection Agency (EPA) Method 300.0.

3.0 SAMPLE INTEGRITY

Samples within this sample delivery group (SDG), collected from ST012, were submitted to TestAmerica Laboratories (TAL) in Phoenix, Arizona. The samples were submitted for bromide and sulfate by USEPA Method E300.0.

Based on the information provided on the cooler receipt forms, samples arrived at the laboratory within temperature and preservation requirements. Completed COC documents are included in the data package.

4.0 SAMPLE IDENTIFICATION

This SDG contains the following water and quality control (QC) samples:

Site: ST012	QC Samples
ST012-W11-WG-080714	
ST012-W30-WG-080714	

These samples were collected on 7 August 2014.

5.0 SAMPLE QUALIFICATION

Only those components that required qualification of the data are presented in this narrative. All Level II components were within the QC limits; therefore, no qualification was required for the data.

6.0 BROMIDE AND SULFATE (EPA 300.0)

Samples collected from site ST012 were submitted for bromide and sulfate by Method E300.0. A Level II validation was performed on this method and all components were within the QAPP/SOP criteria.

6.1 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of bromide and sulfate by USEPA Method E300.0 with the exception of analytes that

required dilution. Each of the samples reported in this SDG required dilution for sulfate and one sample required dilution for bromide resulting in elevated LOQs.

7.0 OVERALL SITE EVALUATION AND PROFESSIONAL JUDGMENT FLAGGING CHANGES

Edits to the DQE qualifiers by professional judgment were not required, and the data are usable as qualified in this data narrative.

8.0 SUMMARY OF DATA QUALITY INDICATORS

This section provides an assessment of the data based on project data quality indicators (DQIs) described on QAPP Worksheet #37 of the QAPP/SOP (AMEC, 2012). The DQIs consist of precision, accuracy, representativeness, comparability, completeness, and sensitivity.

8.1 Precision

An assessment of precision of analytical data is accomplished via review of field duplicate and MS/MSD analyses. Field duplicate and MS/MSD analyses are used to assess field variability, which includes sample collection/handling as well as matrix homogeneity. Precision is expressed as the relative percent difference (RPD) between results for duplicate pairs.

No field duplicate or project specific samples were submitted for MS/MSD analyses in the SDG; however, the laboratory analyzed a LCS/LCSD and a MS/MSD on a non-project sample for batch precision. Duplicate precision for anions was within QC limits; therefore, overall method and sample matrix precision are acceptable and achieve project objectives.

8.2 Accuracy (Bias)

An assessment of accuracy of analytical data is accomplished via evaluation of the spike recoveries in the MS/MSD, LCS, post digestion spike samples, and surrogate spike compounds, in addition to calibration criteria. Accuracy is expressed as percent recovery. Accuracy data were compliant with the program document QAPP/SOP, as all associated LCS/LCSD recoveries were within control. Therefore, the data results indicate method and matrix accuracy is acceptable to achieve project objectives.

8.3 Representativeness

Representativeness for the analytical data is determined through evaluation of the associated blank data and evaluation of appropriate sample handling procedures. All samples were properly stored and preserved in the field and at TestAmerica and blanks were all non-detect. The analytical results indicate sample data are representative of the Site conditions.

8.4 Comparability

Comparability addresses the confidence with which one data set can be compared to another. Use of appropriate sampling methods, COC procedures, and EPA-approved analytical methods, as well as adherence to strict QA/QC procedures, provide the basis for uniformity in sample collection and analysis. Analytical data were generated by TestAmerica using standard reporting units of milligrams per liter and methods for the parameters. In addition, sample collection and analytical method protocols were implemented in accordance with approved, documented procedures. Analytical data are determined to be comparable to previous Site results.

8.5 Completeness

Completeness of the field sampling activities were assessed in terms of the actual number and type of sample results received from the field and laboratory, as compared with the planned number and type of sample results. All samples planned were collected which meets a field completeness of 100%.

Analytical completeness of data is a measure of the number of valid project-specific data results obtained in comparison to the total number of data results projected to achieve project DQOs. Valid data are defined as data that meet the project-specific DQOs. No data were rejected as a result of the data validation. The completeness goals met the 90 percent goal for field and laboratory data expected for this project.

8.6 Sensitivity

Analytical methods and LOQs were implemented in accordance with the QAPP/SOP and EPA promulgated methodologies. Method RLs were achieved for the event except when sample dilutions were required to bring target compounds within the linear range of the instrument calibration. These include modified RLs for selected detections. Although the laboratory RLs for samples requiring dilution exceed the QAPP RLs, sensitivity requirements were met.

8.7 Usability Summary

The data generated during the August 2014 sampling event did not require qualification and the analytical results indicate sample data is representative of the Site conditions. The DQOs for the Enhanced Bioremediation Field Test is to produce data to support design of anaerobic methods for the ST012 remedy if selected.

9.0 REFERENCES

AFCEE, 2005. Quality Assurance Project Plan, Version 4.0.01, May, 2005.

AMEC, August 11, 2014. *Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) (Enhanced Bioremediation Field Test Plan) Operable Unit 2 Site ST012 - Liquid Fuels Storage Area, Former Williams Air Force Base, Mesa, Arizona*.

AMEC, February 23, 2012. *Performance Based Remediation Program Quality Assurance Project Plan (QAPP) and Standard Operating Procedures (SOPs) (QAP/SOP), Former Williams Air Force Base, Mesa, Arizona*.

DoD, 2010. Department of Defense Quality System Manual, Version 4.2 Final, October 2010.

Prepared/Date: DWK 8/28/2014
Checked/Date: JAH 9/02/2014

Flagged Data Reports

Client: AMEC Environment & Infrastructure, Inc.
Project/Site: Former Williams AFB ST012 ERB

TestAmerica Job ID: 550-29406-1

Client Sample ID: ST012-W30-WG-080714
Date Collected: 08/07/14 08:37
Date Received: 08/07/14 13:20

Lab Sample ID: 550-29406-1
Matrix: Water

No plugs
Dwk 8/26/14

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	16		10		mg/L			08/08/14 21:11	20
Sulfate	240		40		mg/L			08/08/14 21:11	20

Client Sample ID: ST012-W11-WG-080714
Date Collected: 08/07/14 10:30
Date Received: 08/07/14 13:20

Lab Sample ID: 550-29406-2
Matrix: Water

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	4.9		0.50		mg/L			08/12/14 19:40	1
Sulfate	230		40		mg/L			08/08/14 21:29	20

Data Quality Evaluation Checklists

Method Validated: 300.0 | Initial Review by: D. Knaub | Date: 8/28/2014 | SDG#: 550-29406-1
Senior Review by: J. Hartness | Date: 9/02/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	ok
Limit of Detection Determination and Verification (LOD) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOD verification checks shall be performed (see box D-13)	See 40 CFR 1368. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL / LOD verification check at higher level and set MDL higher or reconduct MDL study (see box D-13).	NA	Samples cannot be analyzed without a valid MDL.	Level II
Limit of Quantitation Establishment and Verification (LOQ) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOQ verification checks shall be performed (see box D-14)	Within calibration range including low standard; within method precision and accuracy.	Re-run LOQ	NA	Samples cannot be analyzed without a valid LOQ	Level II

Method Validated: 300.0 Initial Review by: D. Knaub Date: 8/28/2014 SDG#: 550-29406-1
Senior Review by: J. Hartness Date: 9/02/2014 Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time (RT) Window Width Calculated for Each Analyte and Surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 24-hour study.	NA	NA		Level II
Container, Preservation, and Holding Time	All field samples	500 ml poly, Cool to 4°C Nitrate – 48 hours Nitrite, sulfate, chloride – 28 days	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collected: 8/07/14 Temp: 3.3°C Bromide and Sulfate Analyzed: 8/08/14 and 8/12/14 OK
ICAL for All Analytes (Minimum Three Standards and One Calibration Blank)	Initial calibration prior to sample analysis	R ≥ 0.995	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.	Level II
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 10% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	Level II
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL and at the beginning of the analytical shift	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift.	NA	NA		Level II

Method Validated: 300.0 | Initial Review by: D. Knaub | Date: 8/28/2014 | SDG#: 550-29406-1
Senior Review by: J. Hartness | Date: 9/02/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Midrange Continuing Calibration Verification (CCV)	After every 10 field samples and at end of the analysis sequence.	All analytes within established retention time windows and within ± 10% of true value	Correct problem then repeat CCV. If that fails, then repeat ICAL. Reanalyze all samples since last successful calibration verification.	Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification, if . reanalysis is not possible.	No samples may be analyzed until the problem has been corrected.	Level II
Method Blank	One per preparatory batch	No analytes detected > ½ RL. See box D-1.	Correct problem, then see criteria in box D-1; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	Lab: Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch. Validator; Apply "B" flag if result is less than 5x method blank.		p. 8 Bromide and Sulfate MB 550-41742/2= ND MB 550-41898/2= ND
Laboratory Control Sample (LCS) Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	Use laboratory in-house LCS acceptance criteria (not to exceed 20%).See Box D-3.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix G)	If corrective action fails apply J-flag to specific analyte(s) in all samples in the associated preparatory batch		p. 8 Bromide and Sulfate LCS/LCSD 550-41742/5,6 All ok p. 8-9 LCS/LCSD 550-41898/5,6 All ok

Method Validated: 300.0 | Initial Review by: D. Knaub | Date: 8/28/2014 | SDG#: 550-29406-1
Senior Review by: J. Hartness | Date: 9/02/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Matrix Spike (MS)	One MS per preparatory batch per matrix (see box D- 7)	For matrix evaluation, use laboratory in-house LCS acceptance criteria (not to exceed 20%).	Examine the project-specific 000s. Contact the client as to additional measures to be taken,	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	MS/MSD listed is not associated with this SDG
Matrix Spike Duplicate (MSD) or Sample Duplicate	One per preparatory batch per matrix	RPD ≤15% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	See above
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤10%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		No field duplicates submitted with this SDG
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between LOD and LOQ. Validator flags: If using AFCEE; Apply "F" flag		No samples reported between LOD and LOQ
QC Blanks (Equipment Blanks and Field Blanks)	Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B".		Not collected

Data Evaluation Narrative
AMEC Project: Former Williams AFB
AMEC Project Number: 9101110001.5300.5301
Site: ST012 – Enhanced Bioremediation Field Test
Sampling Event: August 2014
Matrix: Groundwater

SDG: 550-29660-1

1.0 INTRODUCTION

A data quality evaluation (DQE) was performed on the data reported for the Enhanced Bioremediation field test conducted at Site ST012 in August 2014 at the former Williams Air Force Base (WAFB), located in Mesa, Arizona. The following sections provide summary discussions of the required data qualifications for each site and analytical methods for samples collected at the former WAFB. Data validation was conducted on 100% of the primary samples and field quality control samples (rinsate blanks and laboratory control sample/laboratory control sample duplicate [LCS/LCSD] samples). Data validation was performed using supplemental checklists to review the following quality control elements. A Level II DQE was performed on the analyses using the following criteria: laboratory case narrative, sample documentation, chain-of-custody, holding time protocols, method blank results, laboratory control sample (LCS) results, surrogate recoveries (where applicable), method sensitivity, and completeness.

Data was reviewed using precision and accuracy control limits presented in The Department of Defense (DoD) Quality Systems Manual (QSM) Version 4.2 (DoD, 2010). DQE data qualifications were applied if necessary in accordance with procedures in Air Force Center for Environmental Excellence (AFCEE) Quality Assurance Project Plan (QAPP), Version 4.0.01 (AFCEE, 2005), the method, and professional judgment using the following qualifiers:

J = The reported concentration is considered an estimated value due to discrepancies in meeting certain analyte-specific quality control criteria.
F = The reported concentration is between the reporting limit (RL) and method detection limit (MDL) and is considered an estimated value
UJ = The target compound was not detected and the reporting limit is considered imprecise due to discrepancies in meeting certain analyte-specific quality control criteria.
B = The result may be biased high or a false positive based on blank data.
M = The reported concentration is estimated due to matrix effects.
R = The data are considered unusable due to discrepancies in meeting certain quality control criteria and may not be used in decision making.

2.0 DELIVERABLES

The data packages as submitted to AMEC Environment and Infrastructure, Inc. (AMEC) are complete as stipulated in the Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) for Site ST012 Enhanced Bioremediation Field Test Plan (AMEC, 2014), and the applicable guidelines described in the former Williams AFB Performance Based Remediation Program QAPP and standard operating procedures (SOPs) (collectively referred to as the QAPP/SOP [AMEC, 2012]) for U.S. States Environmental Protection Agency (EPA) Method 300.0.

3.0 SAMPLE INTEGRITY

Samples within this sample delivery group (SDG), collected from ST012, were submitted to TestAmerica Laboratories (TAL) in Phoenix, Arizona. The samples were submitted for bromide and sulfate by USEPA Method E300.0.

Based on the information provided on the cooler receipt forms, samples arrived at the laboratory within temperature and preservation requirements. Completed COC documents are included in the data package.

4.0 SAMPLE IDENTIFICATION

This SDG contains the following water and quality control (QC) samples:

Site: ST012	QC Samples
ST012-W11-WG-081214	
ST012-W30-WG-081214	

These samples were collected on 12 August 2014.

5.0 SAMPLE QUALIFICATION

Only those components that required qualification of the data are presented in this narrative. All Level II components were within the QC limits; therefore, no qualification was required for the data.

6.0 BROMIDE AND SULFATE (EPA 300.0)

Samples collected from site ST012 were submitted for bromide and sulfate by Method E300.0. A Level II validation was performed on this method and all components were within the QAPP/SOP criteria.

6.1 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of bromide and sulfate by USEPA Method E300.0 with the exception of analytes that

required dilution. Both of the samples reported in this SDG required dilution for sulfate resulting in elevated LOQs.

7.0 OVERALL SITE EVALUATION AND PROFESSIONAL JUDGMENT FLAGGING CHANGES

Edits to the DQE qualifiers by professional judgment were not required, and the data are usable as qualified in this data narrative.

8.0 SUMMARY OF DATA QUALITY INDICATORS

This section provides an assessment of the data based on project data quality indicators (DQIs) described on QAPP Worksheet #37 of the QAPP/SOP (AMEC, 2012). The DQIs consist of precision, accuracy, representativeness, comparability, completeness, and sensitivity.

8.1 Precision

An assessment of precision of analytical data is accomplished via review of field duplicate and MS/MSD analyses. Field duplicate and MS/MSD analyses are used to assess field variability, which includes sample collection/handling as well as matrix homogeneity. Precision is expressed as the relative percent difference (RPD) between results for duplicate pairs.

No field duplicate or project specific samples were submitted for MS/MSD analyses in the SDG; however, the laboratory analyzed a LCS/LCSD and a MS/MSD on a non-project sample for batch precision. Duplicate precision for anions was within QC limits; therefore, overall method and sample matrix precision are acceptable and achieve project objectives.

8.2 Accuracy (Bias)

An assessment of accuracy of analytical data is accomplished via evaluation of the spike recoveries in the MS/MSD, LCS, post digestion spike samples, and surrogate spike compounds, in addition to calibration criteria. Accuracy is expressed as percent recovery. Accuracy data were compliant with the program document QAPP/SOP, as all associated LCS/LCSD recoveries were within control. Therefore, the data results indicate method and matrix accuracy is acceptable to achieve project objectives.

8.3 Representativeness

Representativeness for the analytical data is determined through evaluation of the associated blank data and evaluation of appropriate sample handling procedures. All samples were properly stored and preserved in the field and at TestAmerica and blanks were all non-detect. The analytical results indicate sample data are representative of the Site conditions.

8.4 Comparability

Comparability addresses the confidence with which one data set can be compared to another. Use of appropriate sampling methods, COC procedures, and EPA-approved analytical methods, as well as adherence to strict QA/QC procedures, provide the basis for uniformity in sample collection and analysis. Analytical data were generated by TestAmerica using standard reporting units of milligrams per liter and methods for the parameters. In addition, sample collection and analytical method protocols were implemented in accordance with approved, documented procedures. Analytical data are determined to be comparable to previous Site results.

8.5 Completeness

Completeness of the field sampling activities were assessed in terms of the actual number and type of sample results received from the field and laboratory, as compared with the planned number and type of sample results. All samples planned were collected which meets a field completeness of 100%.

Analytical completeness of data is a measure of the number of valid project-specific data results obtained in comparison to the total number of data results projected to achieve project DQOs. Valid data are defined as data that meet the project-specific DQOs. No data were rejected as a result of the data validation. The completeness goals met the 90 percent goal for field and laboratory data expected for this project.

8.6 Sensitivity

Analytical methods and LOQs were implemented in accordance with the QAPP/SOP and EPA promulgated methodologies. Method RLs were achieved for the event except when sample dilutions were required to bring target compounds within the linear range of the instrument calibration. These include modified RLs for selected detections. Although the laboratory RLs for samples requiring dilution exceed the QAPP RLs, sensitivity requirements were met.

8.7 Usability Summary

The data generated during the August 2014 sampling event did not require qualification and the analytical results indicate sample data is representative of the Site conditions. The DQOs for the Enhanced Bioremediation Field Test is to produce data to support design of anaerobic methods for the ST012 remedy if selected.

9.0 REFERENCES

AFCEE, 2005. Quality Assurance Project Plan, Version 4.0.01, May, 2005.

AMEC, August 11, 2014. *Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) (Enhanced Bioremediation Field Test Plan) Operable Unit 2 Site ST012 - Liquid Fuels Storage Area, Former Williams Air Force Base, Mesa, Arizona*.

AMEC, February 23, 2012. *Performance Based Remediation Program Quality Assurance Project Plan (QAPP) and Standard Operating Procedures (SOPs) (QAP/SOP), Former Williams Air Force Base, Mesa, Arizona*.

DoD, 2010. Department of Defense Quality System Manual, Version 4.2 Final, October 2010.

Prepared/Date: DWK 8/28/2014
Checked/Date: JAH 9/02/2014

Flagged Data Reports

Client: AMEC Environment & Infrastructure, Inc.
Project/Site: FWAFB-ST012

TestAmerica Job ID: 550-29660-1

Client Sample ID: ST012-W30-WG-081214
Date Collected: 08/12/14 09:02
Date Received: 08/12/14 14:04

Lab Sample ID: 550-29660-1
Matrix: Water

No flags
DWK 8/20/14

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	11		0.50		mg/L			08/12/14 20:16	1
Sulfate	140		40		mg/L			08/12/14 20:35	20

Client Sample ID: ST012-W11-WG-081214
Date Collected: 08/12/14 10:24
Date Received: 08/12/14 14:04

Lab Sample ID: 550-29660-2
Matrix: Water

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	3.0		0.50		mg/L			08/12/14 20:53	1
Sulfate	110		40		mg/L			08/12/14 21:12	20

Data Quality Evaluation Checklists

Method Validated: 300.0 | Initial Review by: D. Knaub | Date: 8/28/2014 | SDG#: 550-29660-1
Senior Review by: J. Hartness | Date: 9/02/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	ok
Limit of Detection Determination and Verification (LOD) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOD verification checks shall be performed (see box D-13)	See 40 CFR 1368. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL / LOD verification check at higher level and set MDL higher or reconduct MDL study (see box D-13).	NA	Samples cannot be analyzed without a valid MDL.	Level II
Limit of Quantitation Establishment and Verification (LOQ) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOQ verification checks shall be performed (see box D-14)	Within calibration range including low standard; within method precision and accuracy.	Re-run LOQ	NA	Samples cannot be analyzed without a valid LOQ	Level II

Method Validated: 300.0 | Initial Review by: D. Knaub | Date: 8/28/2014 | SDG#: 550-29660-1
Senior Review by: J. Hartness | Date: 9/02/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time (RT) Window Width Calculated for Each Analyte and Surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 24-hour study.	NA	NA		Level II
Container, Preservation, and Holding Time	All field samples	500 ml poly, Cool to 6°C Nitrate – 48 hours Nitrite, sulfate, chloride – 28 days	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collected: 8/12/14 Temp: 4.1°C Bromide and Sulfate Analyzed: 8/12/14 OK
ICAL for All Analytes (Minimum Three Standards and One Calibration Blank)	Initial calibration prior to sample analysis	R ≥ 0.995	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.	Level II
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 10% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	Level II
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL and at the beginning of the analytical shift	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift.	NA	NA		Level II

Method Validated: 300.0 | Initial Review by: D. Knaub | Date: 8/28/2014 | SDG#: 550-29660-1
Senior Review by: J. Hartness | Date: 9/02/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Midrange Continuing Calibration Verification (CCV)	After every 10 field samples and at end of the analysis sequence.	All analytes within established retention time windows and within ± 10% of true value	Correct problem then repeat CCV. If that fails, then repeat ICAL. Reanalyze all samples since last successful calibration verification.	Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification, if . reanalysis is not possible.	No samples may be analyzed until the problem has been corrected.	Level II
Method Blank	One per preparatory batch	No analytes detected > ½ RL. See box D-1.	Correct problem, then see criteria in box D-1; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	Lab: Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch. Validator; Apply "B" flag if result is less than 5x method blank.		p. 8 Bromide and Sulfate MB 550-41898/2= ND
Laboratory Control Sample (LCS) Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	Use laboratory in-house LCS acceptance criteria (not to exceed 20%).See Box D-3.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix G)	If corrective action fails apply J-flag to specific analyte(s) in all samples in the associated preparatory batch		p. 8 Bromide and Sulfate LCS/LCSD 550-41898/5,6 All ok

Method Validated: 300.0 | Initial Review by: D. Knaub | Date: 8/28/2014 | SDG#: 550-29660-1
Senior Review by: J. Hartness | Date: 9/02/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Matrix Spike (MS)	One MS per preparatory batch per matrix (see box D- 7)	For matrix evaluation, use laboratory in-house LCS acceptance criteria (not to exceed 20%).	Examine the project-specific 000s. Contact the client as to additional measures to be taken,	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	MS/MSD listed is not associated with this SDG
Matrix Spike Duplicate (MSD) or Sample Duplicate	One per preparatory batch per matrix	RPD ≤15% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	See above
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤10%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		No field duplicates submitted with this SDG
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between LOD and LOQ. Validator flags: If using AFCEE; Apply "F" flag		No samples reported between LOD and LOQ
QC Blanks (Equipment Blanks and Field Blanks)	Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B".		Not collected

Data Evaluation Narrative
AMEC Project: Former Williams AFB
AMEC Project Number: 9101110001.5300.5301
Site: ST012 – Enhanced Bioremediation Field Test
Sampling Event: August 2014
Matrix: Groundwater

SDG: 550-29931-1

1.0 INTRODUCTION

A data quality evaluation (DQE) was performed on the data reported for the Enhanced Bioremediation field test conducted at Site ST012 in August 2014 at the former Williams Air Force Base (WAFB), located in Mesa, Arizona. The following sections provide summary discussions of the required data qualifications for each site and analytical methods for samples collected at the former WAFB. Data validation was conducted on 100% of the primary samples and field quality control samples (rinsate blanks and laboratory control sample/laboratory control sample duplicate [LCS/LCSD] samples). Data validation was performed using supplemental checklists to review the following quality control elements. A Level II DQE was performed on the analyses using the following criteria: laboratory case narrative, sample documentation, chain-of-custody, holding time protocols, method blank results, laboratory control sample (LCS) results, surrogate recoveries (where applicable), method sensitivity, and completeness.

Data was reviewed using precision and accuracy control limits presented in The Department of Defense (DoD) Quality Systems Manual (QSM) Version 4.2 (DoD, 2010). DQE data qualifications were applied if necessary in accordance with procedures in Air Force Center for Environmental Excellence (AFCEE) Quality Assurance Project Plan (QAPP), Version 4.0.01 (AFCEE, 2005), the method, and professional judgment using the following qualifiers:

J = The reported concentration is considered an estimated value due to discrepancies in meeting certain analyte-specific quality control criteria.
F = The reported concentration is between the reporting limit (RL) and method detection limit (MDL) and is considered an estimated value
UJ = The target compound was not detected and the reporting limit is considered imprecise due to discrepancies in meeting certain analyte-specific quality control criteria.
B = The result may be biased high or a false positive based on blank data.
M = The reported concentration is estimated due to matrix effects.
R = The data are considered unusable due to discrepancies in meeting certain quality control criteria and may not be used in decision making.

2.0 DELIVERABLES

The data packages as submitted to AMEC Environment and Infrastructure, Inc. (AMEC) are complete as stipulated in the Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) for Site ST012 Enhanced Bioremediation Field Test Plan (AMEC, 2014), and the applicable guidelines described in the former Williams AFB Performance Based Remediation Program QAPP and standard operating procedures (SOPs) (collectively referred to as the QAPP/SOP [AMEC, 2012]) for U.S. States Environmental Protection Agency (EPA) Method 300.0.

3.0 SAMPLE INTEGRITY

Samples within this sample delivery group (SDG), collected from ST012, were submitted to TestAmerica Laboratories (TAL) in Phoenix, Arizona. The samples were submitted for bromide and sulfate by USEPA Method E300.0.

Based on the information provided on the cooler receipt forms, samples arrived at the laboratory within temperature and preservation requirements. Completed COC documents are included in the data package.

4.0 SAMPLE IDENTIFICATION

This SDG contains the following water and quality control (QC) samples:

Site: ST012	QC Samples
ST012-W11-WG-081514	
ST012-W30-WG-081514	

These samples were collected on 15 August 2014.

5.0 SAMPLE QUALIFICATION

Only those components that required qualification of the data are presented in this narrative. All Level II components were within the QC limits; therefore, no qualification was required for the data.

6.0 BROMIDE AND SULFATE (EPA 300.0)

Samples collected from site ST012 were submitted for bromide and sulfate by Method E300.0. A Level II validation was performed on this method and all components were within the QAPP/SOP criteria.

6.1 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of bromide and sulfate by USEPA Method E300.0 with the exception of analytes that

required dilution. One of the samples reported in this SDG required dilution for sulfate resulting in elevated LOQs.

7.0 OVERALL SITE EVALUATION AND PROFESSIONAL JUDGMENT FLAGGING CHANGES

Edits to the DQE qualifiers by professional judgment were not required, and the data are usable as qualified in this data narrative.

8.0 SUMMARY OF DATA QUALITY INDICATORS

This section provides an assessment of the data based on project data quality indicators (DQIs) described on QAPP Worksheet #37 of the QAPP/SOP (AMEC, 2012). The DQIs consist of precision, accuracy, representativeness, comparability, completeness, and sensitivity.

8.1 Precision

An assessment of precision of analytical data is accomplished via review of field duplicate and MS/MSD analyses. Field duplicate and MS/MSD analyses are used to assess field variability, which includes sample collection/handling as well as matrix homogeneity. Precision is expressed as the relative percent difference (RPD) between results for duplicate pairs.

No field duplicate or project specific samples were submitted for MS/MSD analyses in the SDG; however, the laboratory analyzed a LCS/LCSD and a MS/MSD on a non-project sample for batch precision. Duplicate precision for anions was within QC limits; therefore, overall method and sample matrix precision are acceptable and achieve project objectives.

8.2 Accuracy (Bias)

An assessment of accuracy of analytical data is accomplished via evaluation of the spike recoveries in the MS/MSD, LCS, post digestion spike samples, and surrogate spike compounds, in addition to calibration criteria. Accuracy is expressed as percent recovery. Accuracy data were compliant with the program document QAPP/SOP, as all associated LCS/LCSD recoveries were within control. Therefore, the data results indicate method and matrix accuracy is acceptable to achieve project objectives.

8.3 Representativeness

Representativeness for the analytical data is determined through evaluation of the associated blank data and evaluation of appropriate sample handling procedures. All samples were properly stored and preserved in the field and at TestAmerica and blanks were all non-detect. The analytical results indicate sample data are representative of the Site conditions.

8.4 Comparability

Comparability addresses the confidence with which one data set can be compared to another. Use of appropriate sampling methods, COC procedures, and EPA-approved analytical methods, as well as adherence to strict QA/QC procedures, provide the basis for uniformity in sample collection and analysis. Analytical data were generated by TestAmerica using standard reporting units of milligrams per liter and methods for the parameters. In addition, sample collection and analytical method protocols were implemented in accordance with approved, documented procedures. Analytical data are determined to be comparable to previous Site results.

8.5 Completeness

Completeness of the field sampling activities were assessed in terms of the actual number and type of sample results received from the field and laboratory, as compared with the planned number and type of sample results. All samples planned were collected which meets a field completeness of 100%.

Analytical completeness of data is a measure of the number of valid project-specific data results obtained in comparison to the total number of data results projected to achieve project DQOs. Valid data are defined as data that meet the project-specific DQOs. No data were rejected as a result of the data validation. The completeness goals met the 90 percent goal for field and laboratory data expected for this project.

8.6 Sensitivity

Analytical methods and LOQs were implemented in accordance with the QAPP/SOP and EPA promulgated methodologies. Method RLs were achieved for the event except when sample dilutions were required to bring target compounds within the linear range of the instrument calibration. These include modified RLs for selected detections. Although the laboratory RLs for samples requiring dilution exceed the QAPP RLs, sensitivity requirements were met.

8.7 Usability Summary

The data generated during the August 2014 sampling event did not require qualification and the analytical results indicate sample data is representative of the Site conditions. The DQOs for the Enhanced Bioremediation Field Test is to produce data to support design of anaerobic methods for the ST012 remedy if selected.

9.0 REFERENCES

AFCEE, 2005. Quality Assurance Project Plan, Version 4.0.01, May, 2005.

AMEC, August 11, 2014. *Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) (Enhanced Bioremediation Field Test Plan) Operable Unit 2 Site ST012 - Liquid Fuels Storage Area, Former Williams Air Force Base, Mesa, Arizona*.

AMEC, February 23, 2012. *Performance Based Remediation Program Quality Assurance Project Plan (QAPP) and Standard Operating Procedures (SOPs) (QAP/SOP), Former Williams Air Force Base, Mesa, Arizona*.

DoD, 2010. Department of Defense Quality System Manual, Version 4.2 Final, October 2010.

Prepared/Date: DWK 8/28/2014
Checked/Date: JAH 9/02/2014

Flagged Data Reports

Client Sample Results

Client: AMEC Environment & Infrastructure, Inc.
Project/Site: ST012 - FWAFB

TestAmerica Job ID: 550-29931-1

No Hogs
Dry 8/15/14

Client Sample ID: ST012-W30-WG-081514

Lab Sample ID: 550-29931-1
Matrix: Water

Date Collected: 08/15/14 09:12
Date Received: 08/15/14 13:05

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	8.7		0.50		mg/L			08/19/14 17:35	1
Sulfate	100		40		mg/L			08/19/14 17:53	20

Client Sample ID: ST012-W11-WG-081514

Lab Sample ID: 550-29931-2
Matrix: Water

Date Collected: 08/15/14 10:21
Date Received: 08/15/14 13:05

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	2.4		0.50		mg/L			08/19/14 18:12	1
Sulfate	73		2.0		mg/L			08/19/14 18:12	1

Data Quality Evaluation Checklists

Method Validated: 300.0 | Initial Review by: D. Knaub | Date: 8/28/2014 | SDG#: 550-29931-1
Senior Review by: J. Hartness | Date: 9/02/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	ok
Limit of Detection Determination and Verification (LOD) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOD verification checks shall be performed (see box D-13)	See 40 CFR 1368. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL / LOD verification check at higher level and set MDL higher or reconduct MDL study (see box D-13).	NA	Samples cannot be analyzed without a valid MDL.	Level II
Limit of Quantitation Establishment and Verification (LOQ) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOQ verification checks shall be performed (see box D-14)	Within calibration range including low standard; within method precision and accuracy.	Re-run LOQ	NA	Samples cannot be analyzed without a valid LOQ	Level II

Method Validated: 300.0 | Initial Review by: D. Knaub | Date: 8/28/2014 | SDG#: 550-29931-1
Senior Review by: J. Hartness | Date: 9/02/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time (RT) Window Width Calculated for Each Analyte and Surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 24-hour study.	NA	NA		Level II
Container, Preservation, and Holding Time	All field samples	500 ml poly, Cool to 4°C Nitrate – 48 hours Nitrite, sulfate, chloride – 28 days	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collected: 8/15/14 Temp: 9.2°C received same day as collected on ice- no qualification required. Bromide and Sulfate Analyzed: 8/19/14 OK
ICAL for All Analytes (Minimum Three Standards and One Calibration Blank)	Initial calibration prior to sample analysis	R ≥ 0.995	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.	Level II
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 10% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	Level II
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL and at the beginning of the analytical shift	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift.	NA	NA		Level II

Method Validated: 300.0 | Initial Review by: D. Knaub | Date: 8/28/2014 | SDG#: 550-29931-1
Senior Review by: J. Hartness | Date: 9/02/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Midrange Continuing Calibration Verification (CCV)	After every 10 field samples and at end of the analysis sequence.	All analytes within established retention time windows and within ± 10% of true value	Correct problem then repeat CCV. If that fails, then repeat ICAL. Reanalyze all samples since last successful calibration verification.	Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification, if . reanalysis is not possible.	No samples may be analyzed until the problem has been corrected.	Level II
Method Blank	One per preparatory batch	No analytes detected > ½ RL. See box D-1.	Correct problem, then see criteria in box D-1; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	Lab: Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch. Validator; Apply "B" flag if result is less than 5x method blank.		p. 8 Bromide and Sulfate MB 550-42503/2= ND
Laboratory Control Sample (LCS) Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	Use laboratory in-house LCS acceptance criteria (not to exceed 20%).See Box D-3.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix G)	If corrective action fails apply J-flag to specific analyte(s) in all samples in the associated preparatory batch		p. 8 Bromide and Sulfate LCS/LCSD 550-42503/5,6 All ok

Method Validated: 300.0 | Initial Review by: D. Knaub | Date: 8/28/2014 | SDG#: 550-29931-1
Senior Review by: J. Hartness | Date: 9/02/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Matrix Spike (MS)	One MS per preparatory batch per matrix (see box D- 7)	For matrix evaluation, use laboratory in-house LCS acceptance criteria (not to exceed 20%).	Examine the project-specific 000s. Contact the client as to additional measures to be taken,	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	MS/MSD listed is not associated with this SDG
Matrix Spike Duplicate (MSD) or Sample Duplicate	One per preparatory batch per matrix	RPD ≤15% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	See above
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤10%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		No field duplicates submitted with this SDG
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between LOD and LOQ. Validator flags: If using AFCEE; Apply "F" flag		No samples reported between LOD and LOQ
QC Blanks (Equipment Blanks and Field Blanks)	Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B".		Not collected

Data Evaluation Narrative
AMEC Project: Former Williams AFB
AMEC Project Number: 9101110001.5300.5301
Site: ST012 – Enhanced Bioremediation Field Test
Sampling Event: August 2014
Matrix: Groundwater

SDG: 550-30076-1

1.0 INTRODUCTION

A data quality evaluation (DQE) was performed on the data reported for the Enhanced Bioremediation field test conducted at Site ST012 in August 2014 at the former Williams Air Force Base (WAFB), located in Mesa, Arizona. The following sections provide summary discussions of the required data qualifications for each site and analytical methods for samples collected at the former WAFB. Data validation was conducted on 100% of the primary samples and field quality control samples (rinsate blanks and laboratory control sample/laboratory control sample duplicate [LCS/LCSD] samples). Data validation was performed using supplemental checklists to review the following quality control elements. A Level II DQE was performed on the analyses using the following criteria: laboratory case narrative, sample documentation, chain-of-custody, holding time protocols, method blank results, laboratory control sample (LCS) results, surrogate recoveries (where applicable), method sensitivity, and completeness.

Data was reviewed using precision and accuracy control limits presented in The Department of Defense (DoD) Quality Systems Manual (QSM) Version 4.2 (DoD, 2010). DQE data qualifications were applied if necessary in accordance with procedures in Air Force Center for Environmental Excellence (AFCEE) Quality Assurance Project Plan (QAPP), Version 4.0.01 (AFCEE, 2005), the method, and professional judgment using the following qualifiers:

- J = The reported concentration is considered an estimated value due to discrepancies in meeting certain analyte-specific quality control criteria.
- F = The reported concentration is between the reporting limit (RL) and method detection limit (MDL) and is considered an estimated value
- UJ = The target compound was not detected and the reporting limit is considered imprecise due to discrepancies in meeting certain analyte-specific quality control criteria.
- B = The result may be biased high or a false positive based on blank data.
- M = The reported concentration is estimated due to matrix effects.
- R = The data are considered unusable due to discrepancies in meeting certain quality control criteria and may not be used in decision making.

2.0 DELIVERABLES

The data packages as submitted to AMEC Environment and Infrastructure, Inc. (AMEC) are complete as stipulated in the Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) for Site ST012 Enhanced Bioremediation Field Test Plan (AMEC, 2014), and the applicable guidelines described in the former Williams AFB Performance Based Remediation Program QAPP and standard operating procedures (SOPs) (collectively referred to as the QAPP/SOP [AMEC, 2012]) for U.S. States Environmental Protection Agency (EPA) Method 300.0.

3.0 SAMPLE INTEGRITY

Samples within this sample delivery group (SDG), collected from ST012, were submitted to TestAmerica Laboratories (TAL) in Phoenix, Arizona. The samples were submitted for bromide and sulfate by USEPA Method E300.0.

Based on the information provided on the cooler receipt forms, samples arrived at the laboratory within temperature and preservation requirements. Completed COC documents are included in the data package.

4.0 SAMPLE IDENTIFICATION

This SDG contains the following water and quality control (QC) samples:

Site: ST012	QC Samples
ST012-W11-WG-081914	
ST012-W30-WG-081914	

These samples were collected on 19 August 2014.

5.0 SAMPLE QUALIFICATION

Only those components that required qualification of the data are presented in this narrative. All Level II components were within the QC limits; therefore, no qualification was required for the data.

6.0 BROMIDE AND SULFATE (EPA 300.0)

Samples collected from site ST012 were submitted for bromide and sulfate by Method E300.0. A Level II validation was performed on this method and all components were within the QAPP/SOP criteria.

6.1 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of bromide and sulfate by USEPA Method E300.0 with the exception of analytes that required dilution. None of the samples reported in this SDG required dilution.

7.0 OVERALL SITE EVALUATION AND PROFESSIONAL JUDGMENT FLAGGING CHANGES

Edits to the DQE qualifiers by professional judgment were not required, and the data are usable as qualified in this data narrative.

8.0 SUMMARY OF DATA QUALITY INDICATORS

This section provides an assessment of the data based on project data quality indicators (DQIs) described on QAPP Worksheet #37 of the QAPP/SOP (AMEC, 2012). The DQIs consist of precision, accuracy, representativeness, comparability, completeness, and sensitivity.

8.1 Precision

An assessment of precision of analytical data is accomplished via review of field duplicate and MS/MSD analyses. Field duplicate and MS/MSD analyses are used to assess field variability, which includes sample collection/handling as well as matrix homogeneity. Precision is expressed as the relative percent difference (RPD) between results for duplicate pairs.

No field duplicate or project specific samples were submitted for MS/MSD analyses in the SDG; however, the laboratory analyzed a LCS/LCSD and a MS/MSD on a non-project sample for batch precision. Duplicate precision for anions was within QC limits; therefore, overall method and sample matrix precision are acceptable and achieve project objectives.

8.2 Accuracy (Bias)

An assessment of accuracy of analytical data is accomplished via evaluation of the spike recoveries in the MS/MSD, LCS, post digestion spike samples, and surrogate spike compounds, in addition to calibration criteria. Accuracy is expressed as percent recovery. Accuracy data were compliant with the program document QAPP/SOP, as all associated LCS/LCSD recoveries were within control. Therefore, the data results indicate method and matrix accuracy is acceptable to achieve project objectives.

8.3 Representativeness

Representativeness for the analytical data is determined through evaluation of the associated blank data and evaluation of appropriate sample handling procedures. All samples were properly stored and preserved in the field and at TestAmerica and blanks were all non-detect. The analytical results indicate sample data are representative of the Site conditions.

8.4 Comparability

Comparability addresses the confidence with which one data set can be compared to another. Use of appropriate sampling methods, COC procedures, and EPA-approved analytical methods, as well as adherence to strict QA/QC procedures, provide the basis for uniformity in sample collection and analysis. Analytical data were generated by TestAmerica using standard reporting units of milligrams per liter and methods for the parameters. In addition, sample collection and analytical method protocols were implemented in accordance with approved, documented procedures. Analytical data are determined to be comparable to previous Site results.

8.5 Completeness

Completeness of the field sampling activities were assessed in terms of the actual number and type of sample results received from the field and laboratory, as compared with the planned number and type of sample results. All samples planned were collected which meets a field completeness of 100%.

Analytical completeness of data is a measure of the number of valid project-specific data results obtained in comparison to the total number of data results projected to achieve project DQOs. Valid data are defined as data that meet the project-specific DQOs. No data were rejected as a result of the data validation. The completeness goals met the 90 percent goal for field and laboratory data expected for this project.

8.6 Sensitivity

Analytical methods and LOQs were implemented in accordance with the QAPP/SOP and EPA promulgated methodologies. Method RLs were achieved for the event and sensitivity requirements were met.

8.7 Usability Summary

The data generated during the August 2014 sampling event did not require qualification and the analytical results indicate sample data is representative of the Site conditions. The DQOs for the Enhanced Bioremediation Field Test is to produce data to support design of anaerobic methods for the ST012 remedy if selected.

9.0 REFERENCES

AFCEE, 2005. Quality Assurance Project Plan, Version 4.0.01, May, 2005.

AMEC, August 11, 2014. *Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) (Enhanced Bioremediation Field Test Plan) Operable Unit 2 Site ST012 - Liquid Fuels Storage Area, Former Williams Air Force Base, Mesa, Arizona*.

AMEC, February 23, 2012. *Performance Based Remediation Program Quality Assurance Project Plan (QAPP) and Standard Operating Procedures (SOPs) (QAP/SOP), Former Williams Air Force Base, Mesa, Arizona*.

DoD, 2010. Department of Defense Quality System Manual, Version 4.2 Final, October 2010.

Prepared/Date: DWK 8/28/2014
Checked/Date: JAH 9/02/2014

Flagged Data Reports

Client Sample Results

Client: AMEC Environment & Infrastructure, Inc.
Project/Site: FWAFB ST012 EBR

TestAmerica Job ID: 550-30076-1
SDG: Project 9101110001.5300.5301

No flags
DWF 9/22/14

Client Sample ID: ST012-W30-WG-081914

Lab Sample ID: 550-30076-1

Date Collected: 08/19/14 08:00
Date Received: 08/19/14 12:16

Matrix: Water

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	6.5		0.50		mg/L			08/25/14 16:04	1
Sulfate	67		2.0		mg/L			08/25/14 16:04	1

Client Sample ID: ST012-W11-WG-081914

Lab Sample ID: 550-30076-2

Date Collected: 08/19/14 09:03
Date Received: 08/19/14 12:16

Matrix: Water

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	1.9		0.50		mg/L			08/25/14 16:41	1
Sulfate	42		2.0		mg/L			08/25/14 16:41	1

Data Quality Evaluation Checklists

Method Validated: 300.0 | Initial Review by: D. Knaub | Date: 8/28/2014 | SDG#: 550-30076-1
Senior Review by: J. Hartness | Date: 9/02/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	ok
Limit of Detection Determination and Verification (LOD) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOD verification checks shall be performed (see box D-13)	See 40 CFR 1368. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL / LOD verification check at higher level and set MDL higher or reconduct MDL study (see box D-13).	NA	Samples cannot be analyzed without a valid MDL.	Level II
Limit of Quantitation Establishment and Verification (LOQ) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOQ verification checks shall be performed (see box D-14)	Within calibration range including low standard; within method precision and accuracy.	Re-run LOQ	NA	Samples cannot be analyzed without a valid LOQ	Level II

Method Validated: 300.0 | Initial Review by: D. Knaub | Date: 8/28/2014 | SDG#: 550-30076-1
Senior Review by: J. Hartness | Date: 9/02/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time (RT) Window Width Calculated for Each Analyte and Surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 24-hour study.	NA	NA		Level II
Container, Preservation, and Holding Time	All field samples	500 ml poly, Cool to 4°C Nitrate – 48 hours Nitrite, sulfate, chloride – 28 days	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collected: 8/19/14 Temp: 2.3°C Bromide and Sulfate Analyzed: 8/25/14 OK
ICAL for All Analytes (Minimum Three Standards and One Calibration Blank)	Initial calibration prior to sample analysis	R ≥ 0.995	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.	Level II
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 10% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	Level II
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL and at the beginning of the analytical shift	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift.	NA	NA		Level II

Method Validated: 300.0 | Initial Review by: D. Knaub | Date: 8/28/2014 | SDG#: 550-30076-1
Senior Review by: J. Hartness | Date: 9/02/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Midrange Continuing Calibration Verification (CCV)	After every 10 field samples and at end of the analysis sequence.	All analytes within established retention time windows and within ± 10% of true value	Correct problem then repeat CCV. If that fails, then repeat ICAL. Reanalyze all samples since last successful calibration verification.	Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification, if . reanalysis is not possible.	No samples may be analyzed until the problem has been corrected.	Level II
Method Blank	One per preparatory batch	No analytes detected > ½ RL. See box D-1.	Correct problem, then see criteria in box D-1; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	Lab: Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch. Validator; Apply "B" flag if result is less than 5x method blank.		p. 8 Bromide and Sulfate MB 550-42961/2= ND
Laboratory Control Sample (LCS) Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	Use laboratory in-house LCS acceptance criteria (not to exceed 20%).See Box D-3.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix G)	If corrective action fails apply J-flag to specific analyte(s) in all samples in the associated preparatory batch		p. 8 Bromide and Sulfate LCS/LCSD 550-42961/5,6 All ok

Method Validated: 300.0 | Initial Review by: D. Knaub | Date: 8/28/2014 | SDG#: 550-30076-1
Senior Review by: J. Hartness | Date: 9/02/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Matrix Spike (MS)	One MS per preparatory batch per matrix (see box D- 7)	For matrix evaluation, use laboratory in-house LCS acceptance criteria (not to exceed 20%).	Examine the project-specific 000s. Contact the client as to additional measures to be taken,	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	MS/MSD listed is not associated with this SDG
Matrix Spike Duplicate (MSD) or Sample Duplicate	One per preparatory batch per matrix	RPD ≤15% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	See above
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤10%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		No field duplicates submitted with this SDG
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between LOD and LOQ. Validator flags: If using AFCEE; Apply "F" flag		No samples reported between LOD and LOQ
QC Blanks (Equipment Blanks and Field Blanks)	Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B".		Not collected

Data Evaluation Narrative
AMEC Project: Former Williams AFB
AMEC Project Number: 9101110001.5300.5301
Site: ST012 – Enhanced Bioremediation Field Test
Sampling Event: August 2014
Matrix: Groundwater

SDG: 550-30360-1

1.0 INTRODUCTION

A data quality evaluation (DQE) was performed on the data reported for the Enhanced Bioremediation Field Test conducted at Site ST012 in August 2014 at the former Williams Air Force Base (WAFB), located in Mesa, Arizona. The following sections provide summary discussions of the required data qualifications for each site and analytical methods for samples collected at the former WAFB. Data validation was conducted on 100% of the primary samples and field quality control samples (rinsate blanks and laboratory control sample/laboratory control sample duplicate [LCS/LCSD] samples). Data validation was performed using supplemental checklists to review the following quality control elements. A Level II DQE was performed on the analyses using the following criteria: laboratory case narrative, sample documentation, chain-of-custody, holding time protocols, method blank results, laboratory control sample (LCS) results, surrogate recoveries (where applicable), method sensitivity, and completeness.

Data was reviewed using precision and accuracy control limits presented in The Department of Defense (DoD) Quality Systems Manual (QSM) Version 4.2 (DoD, 2010). DQE data qualifications were applied if necessary in accordance with procedures in Air Force Center for Environmental Excellence (AFCEE) Quality Assurance Project Plan (QAPP), Version 4.0.01 (AFCEE, 2005), the method, and professional judgment using the following qualifiers:

J = The reported concentration is considered an estimated value due to discrepancies in meeting certain analyte-specific quality control criteria.
F = The reported concentration is between the reporting limit (RL) and method detection limit (MDL) and is considered an estimated value
UJ = The target compound was not detected and the reporting limit is considered imprecise due to discrepancies in meeting certain analyte-specific quality control criteria.
B = The result may be biased high or a false positive based on blank data.
M = The reported concentration is estimated due to matrix effects.
R = The data are considered unusable due to discrepancies in meeting certain quality control criteria and may not be used in decision making.

2.0 DELIVERABLES

The data packages as submitted to AMEC Environment and Infrastructure, Inc. (AMEC) are complete as stipulated in the Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) for Site ST012 Enhanced Bioremediation Field Test Plan (AMEC, 2014), and the applicable guidelines described in the former Williams AFB Performance Based Remediation Program QAPP and standard operating procedures (SOPs) (collectively referred to as the QAPP/SOP [AMEC, 2012]) for U.S. States Environmental Protection Agency (EPA) Method 300.0.

3.0 SAMPLE INTEGRITY

Samples within this sample delivery group (SDG), collected from ST012, were submitted to TestAmerica Laboratories (TAL) in Phoenix, Arizona. The samples were submitted for bromide and sulfate by USEPA Method E300.0.

Based on the information provided on the cooler receipt forms, samples arrived at the laboratory within temperature and preservation requirements. Completed COC documents are included in the data package.

4.0 SAMPLE IDENTIFICATION

This SDG contains the following water and quality control (QC) samples:

Site: ST012	QC Samples
ST012-W11-WG-082214	
ST012-W30-WG-082214	

These samples were collected on 22 August 2014.

5.0 SAMPLE QUALIFICATION

Only those components that required qualification of the data are presented in this narrative. All Level II components were within the QC limits; therefore, no qualification was required for the data.

6.0 BROMIDE AND SULFATE (EPA 300.0)

Samples collected from site ST012 were submitted for bromide and sulfate by Method E300.0. A Level II validation was performed on this method and all components were within the QAPP/SOP criteria.

6.1 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of bromide and sulfate by USEPA Method E300.0 with the exception of analytes that required dilution. None of the samples reported in this SDG required dilution.

7.0 OVERALL SITE EVALUATION AND PROFESSIONAL JUDGMENT FLAGGING CHANGES

Edits to the DQE qualifiers by professional judgment were not required, and the data are usable as qualified in this data narrative.

8.0 SUMMARY OF DATA QUALITY INDICATORS

This section provides an assessment of the data based on project data quality indicators (DQIs) described on QAPP Worksheet #37 of the QAPP/SOP (AMEC, 2012). The DQIs consist of precision, accuracy, representativeness, comparability, completeness, and sensitivity.

8.1 Precision

An assessment of precision of analytical data is accomplished via review of field duplicate and MS/MSD analyses. Field duplicate and MS/MSD analyses are used to assess field variability, which includes sample collection/handling as well as matrix homogeneity. Precision is expressed as the relative percent difference (RPD) between results for duplicate pairs.

No field duplicate or project specific samples were submitted for MS/MSD analyses in the SDG; however, the laboratory analyzed a LCS/LCSD and a MS/MSD on a non-project sample for batch precision. Duplicate precision for anions was within QC limits; therefore, overall method and sample matrix precision are acceptable and achieve project objectives.

8.2 Accuracy (Bias)

An assessment of accuracy of analytical data is accomplished via evaluation of the spike recoveries in the MS/MSD, LCS, post digestion spike samples, and surrogate spike compounds, in addition to calibration criteria. Accuracy is expressed as percent recovery. Accuracy data were compliant with the program document QAPP/SOP, as all associated LCS/LCSD recoveries were within control. Therefore, the data results indicate method and matrix accuracy is acceptable to achieve project objectives.

8.3 Representativeness

Representativeness for the analytical data is determined through evaluation of the associated blank data and evaluation of appropriate sample handling procedures. All samples were properly stored and preserved in the field and at TestAmerica and blanks were all non-detect. The analytical results indicate sample data are representative of the Site conditions.

8.4 Comparability

Comparability addresses the confidence with which one data set can be compared to another. Use of appropriate sampling methods, COC procedures, and EPA-approved analytical methods, as well as adherence to strict QA/QC procedures, provide the basis for uniformity in sample collection and analysis. Analytical data were generated by TestAmerica using standard reporting units of milligrams per liter and methods for the parameters. In addition, sample collection and analytical method protocols were implemented in accordance with approved, documented procedures. Analytical data are determined to be comparable to previous Site results.

8.5 Completeness

Completeness of the field sampling activities were assessed in terms of the actual number and type of sample results received from the field and laboratory, as compared with the planned number and type of sample results. All samples planned were collected which meets a field completeness of 100%.

Analytical completeness of data is a measure of the number of valid project-specific data results obtained in comparison to the total number of data results projected to achieve project DQOs. Valid data are defined as data that meet the project-specific DQOs. No data were rejected as a result of the data validation. The completeness goals met the 90 percent goal for field and laboratory data expected for this project.

8.6 Sensitivity

Analytical methods and LOQs were implemented in accordance with the QAPP/SOP and EPA promulgated methodologies. Method RLs were achieved for the event and sensitivity requirements were met.

8.7 Usability Summary

The data generated during the August 2014 sampling event did not require qualification and the analytical results indicate sample data is representative of the Site conditions. The DQOs for the Enhanced Bioremediation Field Test is to produce data to support design of anaerobic methods for the ST012 remedy if selected.

9.0 REFERENCES

AFCEE, 2005. Quality Assurance Project Plan, Version 4.0.01, May, 2005.

AMEC, August 11, 2014. *Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) (Enhanced Bioremediation Field Test Plan) Operable Unit 2 Site ST012 - Liquid Fuels Storage Area, Former Williams Air Force Base, Mesa, Arizona*.

AMEC, February 23, 2012. *Performance Based Remediation Program Quality Assurance Project Plan (QAPP) and Standard Operating Procedures (SOPs) (QAP/SOP), Former Williams Air Force Base, Mesa, Arizona*.

DoD, 2010. Department of Defense Quality System Manual, Version 4.2 Final, October 2010.

Prepared/Date: DWK 8/28/2014
Checked/Date: JAH 9/02/2014

Flagged Data Reports

Client Sample Results

Client: AMEC Environment & Infrastructure, Inc.
Project/Site: FWAFB ST012 EBR

TestAmerica Job ID: 550-30076-1
SDG: Project 9101110001.5300.5301

No flags
DWF 9/28/14

Client Sample ID: ST012-W30-WG-081914

Lab Sample ID: 550-30076-1

Date Collected: 08/19/14 08:00
Date Received: 08/19/14 12:16

Matrix: Water

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	6.5		0.50		mg/L			08/25/14 16:04	1
Sulfate	67		2.0		mg/L			08/25/14 16:04	1

Client Sample ID: ST012-W11-WG-081914

Lab Sample ID: 550-30076-2

Date Collected: 08/19/14 09:03
Date Received: 08/19/14 12:16

Matrix: Water

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	1.9		0.50		mg/L			08/25/14 16:41	1
Sulfate	42		2.0		mg/L			08/25/14 16:41	1

Data Quality Evaluation Checklists

Method Validated: 300.0 | Initial Review by: D. Knaub | Date: 8/28/2014 | SDG#: 550-30360-1
Senior Review by: J. Hartness | Date: 9/02/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	ok
Limit of Detection Determination and Verification (LOD) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOD verification checks shall be performed (see box D-13)	See 40 CFR 1368. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL / LOD verification check at higher level and set MDL higher or reconduct MDL study (see box D-13).	NA	Samples cannot be analyzed without a valid MDL.	Level II
Limit of Quantitation Establishment and Verification (LOQ) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOQ verification checks shall be performed (see box D-14)	Within calibration range including low standard; within method precision and accuracy.	Re-run LOQ	NA	Samples cannot be analyzed without a valid LOQ	Level II

Method Validated: 300.0 Initial Review by: D. Knaub Date: 8/28/2014 SDG#: 550-30360-1
Senior Review by: J. Hartness Date: 9/02/2014 Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time (RT) Window Width Calculated for Each Analyte and Surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 24-hour study.	NA	NA		Level II
Container, Preservation, and Holding Time	All field samples	500 ml poly, Cool to 4°C Nitrate – 48 hours Nitrite, sulfate, chloride – 28 days	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collected: 8/22/14 Temp: 0.7°C Bromide and Sulfate Analyzed: 8/27/14 OK
ICAL for All Analytes (Minimum Three Standards and One Calibration Blank)	Initial calibration prior to sample analysis	R ≥ 0.995	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.	Level II
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 10% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	Level II
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL and at the beginning of the analytical shift	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift.	NA	NA		Level II

Method Validated: 300.0 | Initial Review by: D. Knaub | Date: 8/28/2014 | SDG#: 550-30360-1
Senior Review by: J. Hartness | Date: 9/02/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Midrange Continuing Calibration Verification (CCV)	After every 10 field samples and at end of the analysis sequence.	All analytes within established retention time windows and within ± 10% of true value	Correct problem then repeat CCV. If that fails, then repeat ICAL. Reanalyze all samples since last successful calibration verification.	Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification, if . reanalysis is not possible.	No samples may be analyzed until the problem has been corrected.	Level II
Method Blank	One per preparatory batch	No analytes detected > ½ RL. See box D-1.	Correct problem, then see criteria in box D-1; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	Lab: Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch. Validator; Apply "B" flag if result is less than 5x method blank.		p. 8 Bromide and Sulfate MB 550-43104/2= ND
Laboratory Control Sample (LCS) Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	Use laboratory in-house LCS acceptance criteria (not to exceed 20%).See Box D-3.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix G)	If corrective action fails apply J-flag to specific analyte(s) in all samples in the associated preparatory batch		p. 8 Bromide and Sulfate LCS/LCSD 550-43104/5,6 All ok

Method Validated: 300.0 | Initial Review by: D. Knaub | Date: 8/28/2014 | SDG#: 550-30360-1
Senior Review by: J. Hartness | Date: 9/02/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Matrix Spike (MS)	One MS per preparatory batch per matrix (see box D- 7)	For matrix evaluation, use laboratory in-house LCS acceptance criteria (not to exceed 20%).	Examine the project-specific 000s. Contact the client as to additional measures to be taken,	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	MS/MSD listed is not associated with this SDG
Matrix Spike Duplicate (MSD) or Sample Duplicate	One per preparatory batch per matrix	RPD ≤15% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	See above
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤10%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		No field duplicates submitted with this SDG
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between LOD and LOQ. Validator flags: If using AFCEE; Apply "F" flag		No samples reported between LOD and LOQ
QC Blanks (Equipment Blanks and Field Blanks)	Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B".		Not collected

Data Evaluation Narrative
AMEC Project: Former Williams AFB
AMEC Project Number: 9101110001.5300.5301
Site: ST012 – Enhanced Bioremediation Field Test
Sampling Event: August 2014
Matrix: Groundwater

SDG: 550-30492-1

1.0 INTRODUCTION

A data quality evaluation (DQE) was performed on the data reported for the Enhanced Bioremediation field test conducted at Site ST012 in August 2014 at the former Williams Air Force Base (WAFB), located in Mesa, Arizona. The following sections provide summary discussions of the required data qualifications for each site and analytical methods for samples collected at the former WAFB. Data validation was conducted on 100% of the primary samples and field quality control samples (rinsate blanks and laboratory control sample/laboratory control sample duplicate [LCS/LCSD] samples). Data validation was performed using supplemental checklists to review the following quality control elements. A Level II DQE was performed on the analyses using the following criteria: laboratory case narrative, sample documentation, chain-of-custody, holding time protocols, method blank results, laboratory control sample (LCS) results, surrogate recoveries (where applicable), method sensitivity, and completeness.

Data was reviewed using precision and accuracy control limits presented in The Department of Defense (DoD) Quality Systems Manual (QSM) Version 4.2 (DoD, 2010). DQE data qualifications were applied if necessary in accordance with procedures in Air Force Center for Environmental Excellence (AFCEE) Quality Assurance Project Plan (QAPP), Version 4.0.01 (AFCEE, 2005), the method, and professional judgment using the following qualifiers:

J = The reported concentration is considered an estimated value due to discrepancies in meeting certain analyte-specific quality control criteria.
F = The reported concentration is between the reporting limit (RL) and method detection limit (MDL) and is considered an estimated value
UJ = The target compound was not detected and the reporting limit is considered imprecise due to discrepancies in meeting certain analyte-specific quality control criteria.
B = The result may be biased high or a false positive based on blank data.
M = The reported concentration is estimated due to matrix effects.
R = The data are considered unusable due to discrepancies in meeting certain quality control criteria and may not be used in decision making.

2.0 DELIVERABLES

The data packages as submitted to AMEC Environment and Infrastructure, Inc. (AMEC) are complete as stipulated in the Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) for Site ST012 Enhanced Bioremediation Field Test Plan (AMEC, 2014), and the applicable guidelines described in the former Williams AFB Performance Based Remediation Program QAPP and standard operating procedures (SOPs) (collectively referred to as the QAPP/SOP [AMEC, 2012]) for U.S. States Environmental Protection Agency (EPA) Method 300.0.

3.0 SAMPLE INTEGRITY

Samples within this sample delivery group (SDG), collected from ST012, were submitted to TestAmerica Laboratories (TAL) in Phoenix, Arizona. The samples were submitted for bromide and sulfate by USEPA Method E300.0.

Based on the information provided on the cooler receipt forms, samples arrived at the laboratory within temperature and preservation requirements. Completed COC documents are included in the data package.

4.0 SAMPLE IDENTIFICATION

This SDG contains the following water and quality control (QC) samples:

Site: ST012	QC Samples
ST012-W11-WG-082614	
ST012-W30-WG-082614	

These samples were collected on 26 August 2014.

5.0 SAMPLE QUALIFICATION

Only those components that required qualification of the data are presented in this narrative. All Level II components were within the QC limits; therefore, no qualification was required for the data.

6.0 BROMIDE AND SULFATE (EPA 300.0)

Samples collected from site ST012 were submitted for bromide and sulfate by Method E300.0. A Level II validation was performed on this method and all components were within the QAPP/SOP criteria.

6.1 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of bromide and sulfate by USEPA Method E300.0 with the exception of analytes that required dilution. None of the samples reported in this SDG required dilution.

7.0 OVERALL SITE EVALUATION AND PROFESSIONAL JUDGMENT FLAGGING CHANGES

Edits to the DQE qualifiers by professional judgment were not required, and the data are usable as qualified in this data narrative.

8.0 SUMMARY OF DATA QUALITY INDICATORS

This section provides an assessment of the data based on project data quality indicators (DQIs) described on QAPP Worksheet #37 of the QAPP/SOP (AMEC, 2012). The DQIs consist of precision, accuracy, representativeness, comparability, completeness, and sensitivity.

8.1 Precision

An assessment of precision of analytical data is accomplished via review of field duplicate and MS/MSD analyses. Field duplicate and MS/MSD analyses are used to assess field variability, which includes sample collection/handling as well as matrix homogeneity. Precision is expressed as the relative percent difference (RPD) between results for duplicate pairs.

No field duplicate or project specific samples were submitted for MS/MSD analyses in the SDG; however, the laboratory analyzed a LCS/LCSD and a MS/MSD on a non-project sample for batch precision. Duplicate precision for anions was within QC limits; therefore, overall method and sample matrix precision are acceptable and achieve project objectives.

8.2 Accuracy (Bias)

An assessment of accuracy of analytical data is accomplished via evaluation of the spike recoveries in the MS/MSD, LCS, post digestion spike samples, and surrogate spike compounds, in addition to calibration criteria. Accuracy is expressed as percent recovery. Accuracy data were compliant with the program document QAPP/SOP, as all associated LCS/LCSD recoveries were within control. Therefore, the data results indicate method and matrix accuracy is acceptable to achieve project objectives.

8.3 Representativeness

Representativeness for the analytical data is determined through evaluation of the associated blank data and evaluation of appropriate sample handling procedures. All samples were properly stored and preserved in the field and at TestAmerica and blanks were all non-detect. The analytical results indicate sample data are representative of the Site conditions.

8.4 Comparability

Comparability addresses the confidence with which one data set can be compared to another. Use of appropriate sampling methods, COC procedures, and EPA-approved analytical methods, as well as adherence to strict QA/QC procedures, provide the basis for uniformity in sample collection and analysis. Analytical data were generated by TestAmerica using standard reporting units of milligrams per liter and methods for the parameters. In addition, sample collection and analytical method protocols were implemented in accordance with approved, documented procedures. Analytical data are determined to be comparable to previous Site results.

8.5 Completeness

Completeness of the field sampling activities were assessed in terms of the actual number and type of sample results received from the field and laboratory, as compared with the planned number and type of sample results. All samples planned were collected which meets a field completeness of 100%.

Analytical completeness of data is a measure of the number of valid project-specific data results obtained in comparison to the total number of data results projected to achieve project DQOs. Valid data are defined as data that meet the project-specific DQOs. No data were rejected as a result of the data validation. The completeness goals met the 90 percent goal for field and laboratory data expected for this project.

8.6 Sensitivity

Analytical methods and LOQs were implemented in accordance with the QAPP/SOP and EPA promulgated methodologies. Method RLs were achieved for the event and sensitivity requirements were met.

8.7 Usability Summary

The data generated during the August 2014 sampling event did not require qualification and the analytical results indicate sample data is representative of the Site conditions. The DQOs for the Enhanced Bioremediation Field Test is to produce data to support design of anaerobic methods for the ST012 remedy if selected.

9.0 REFERENCES

AFCEE, 2005. Quality Assurance Project Plan, Version 4.0.01, May, 2005.

AMEC, August 11, 2014. *Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) (Enhanced Bioremediation Field Test Plan) Operable Unit 2 Site ST012 - Liquid Fuels Storage Area, Former Williams Air Force Base, Mesa, Arizona*.

AMEC, February 23, 2012. *Performance Based Remediation Program Quality Assurance Project Plan (QAPP) and Standard Operating Procedures (SOPs) (QAP/SOP), Former Williams Air Force Base, Mesa, Arizona*.

DoD, 2010. Department of Defense Quality System Manual, Version 4.2 Final, October 2010.

Prepared/Date: DWK 9/02/2014
Checked/Date: JAH 9/03/2014

Flagged Data Reports

Client Sample ID: ST012-W30-WG-082614 — **Lab Sample ID: 550-30492-1**

Date Collected: 08/26/14 09:45 — Matrix: Water

Date Received: 08/26/14 14:08

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	4.5		0.50		mg/L			08/28/14 02:57	1
Sulfate	34		2.0		mg/L			08/28/14 02:57	1

Client Sample ID: ST012-W11-WG-082614 — **Lab Sample ID: 550-30492-2**

Date Collected: 08/26/14 11:45 — Matrix: Water

Date Received: 08/26/14 14:08

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	1.6		0.50		mg/L			08/28/14 03:34	1
Sulfate	18		2.0		mg/L			08/28/14 03:34	1

Data Quality Evaluation Checklists

Method Validated: 300.0 | Initial Review by: D. Knaub | Date: 9/02/2014 | SDG#: 550-30492-1
Senior Review by: J. Hartness | Date: 9/03/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	ok
Limit of Detection Determination and Verification (LOD) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOD verification checks shall be performed (see box D-13)	See 40 CFR 1368. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL / LOD verification check at higher level and set MDL higher or reconduct MDL study (see box D-13).	NA	Samples cannot be analyzed without a valid MDL.	Level II
Limit of Quantitation Establishment and Verification (LOQ) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOQ verification checks shall be performed (see box D-14)	Within calibration range including low standard; within method precision and accuracy.	Re-run LOQ	NA	Samples cannot be analyzed without a valid LOQ	Level II

Method Validated: 300.0 Initial Review by: D. Knaub Date: 9/02/2014 SDG#: 550-30492-1
Senior Review by: J. Hartness Date: 9/03/2014 Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time (RT) Window Width Calculated for Each Analyte and Surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 24-hour study.	NA	NA		Level II
Container, Preservation, and Holding Time	All field samples	500 ml poly, Cool to 4°C Nitrate – 48 hours Nitrite, sulfate, chloride – 28 days	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collected: 8/26/14 Temp: 9.8°C ***Received same day as collected on ice – no qualification required.*** Bromide and Sulfate Analyzed: 8/28/14 OK
ICAL for All Analytes (Minimum Three Standards and One Calibration Blank)	Initial calibration prior to sample analysis	R ≥ 0.995	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.	Level II
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 10% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	Level II
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL and at the beginning of the analytical shift	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift.	NA	NA		Level II

Method Validated: 300.0 | Initial Review by: D. Knaub | Date: 9/02/2014 | SDG#: 550-30492-1
Senior Review by: J. Hartness | Date: 9/03/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Midrange Continuing Calibration Verification (CCV)	After every 10 field samples and at end of the analysis sequence.	All analytes within established retention time windows and within ± 10% of true value	Correct problem then repeat CCV. If that fails, then repeat ICAL. Reanalyze all samples since last successful calibration verification.	Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification, if . reanalysis is not possible.	No samples may be analyzed until the problem has been corrected.	Level II
Method Blank	One per preparatory batch	No analytes detected > ½ RL. See box D-1.	Correct problem, then see criteria in box D-1; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	Lab: Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch. Validator; Apply "B" flag if result is less than 5x method blank.		p. 8 Bromide and Sulfate MB 550-43195/2= ND
Laboratory Control Sample (LCS) Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	Use laboratory in-house LCS acceptance criteria (not to exceed 20%).See Box D-3.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix G)	If corrective action fails apply J-flag to specific analyte(s) in all samples in the associated preparatory batch		p. 8 Bromide and Sulfate LCS/LCSD 550-43195/5,6 All ok

Method Validated: 300.0 | Initial Review by: D. Knaub | Date: 9/02/2014 | SDG#: 550-30492-1
Senior Review by: J. Hartness | Date: 9/03/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Matrix Spike (MS)	One MS per preparatory batch per matrix (see box D- 7)	For matrix evaluation, use laboratory in-house LCS acceptance criteria (not to exceed 20%).	Examine the project-specific 000s. Contact the client as to additional measures to be taken,	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	MS/MSD listed is not associated with this SDG
Matrix Spike Duplicate (MSD) or Sample Duplicate	One per preparatory batch per matrix	RPD ≤15% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	See above
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤10%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		No field duplicates submitted with this SDG
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between LOD and LOQ. Validator flags: If using AFCEE; Apply "F" flag		No samples reported between LOD and LOQ
QC Blanks (Equipment Blanks and Field Blanks)	Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B".		Not collected

Data Evaluation Narrative
AMEC Project: Former Williams AFB
AMEC Project Number: 9101110001.5300.5301
Site: ST012 – Enhanced Bioremediation Field Test
Sampling Event: August 2014
Matrix: Groundwater

SDG: 550-30706-1

1.0 INTRODUCTION

A data quality evaluation (DQE) was performed on the data reported for the Enhanced Bioremediation Field Test conducted at Site ST012 in August 2014 at the former Williams Air Force Base (WAFB), located in Mesa, Arizona. The following sections provide summary discussions of the required data qualifications for each site and analytical methods for samples collected at the former WAFB. Data validation was conducted on 100% of the primary samples and field quality control samples (rinsate blanks and laboratory control sample/laboratory control sample duplicate [LCS/LCSD] samples). A Level II DQE was performed using supplemental checklists to review the following quality control elements: laboratory case narrative, sample documentation, chain-of-custody, holding time protocols, method blank results, laboratory control sample (LCS) results, surrogate recoveries (where applicable), method sensitivity, and completeness.

Data was reviewed using precision and accuracy control limits presented in The Department of Defense (DoD) Quality Systems Manual (QSM) Version 4.2 (DoD, 2010). DQE data qualifications were applied if necessary in accordance with procedures in Air Force Center for Environmental Excellence (AFCEE) Quality Assurance Project Plan (QAPP), Version 4.0.01 (AFCEE, 2005), the method, and professional judgment using the following qualifiers:

J = The reported concentration is considered an estimated value due to discrepancies in meeting certain analyte-specific quality control criteria.
F = The reported concentration is between the reporting limit (RL) and method detection limit (MDL) and is considered an estimated value
UJ = The target compound was not detected and the reporting limit is considered imprecise due to discrepancies in meeting certain analyte-specific quality control criteria.
B = The result may be biased high or a false positive based on blank data.
M = The reported concentration is estimated due to matrix effects.
R = The data are considered unusable due to discrepancies in meeting certain quality control criteria and may not be used in decision making.

2.0 DELIVERABLES

The data packages as submitted to AMEC Environment and Infrastructure, Inc. (AMEC) are complete as stipulated in the Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) for Site ST012 Enhanced Bioremediation Field Test Plan (AMEC, 2014), and the applicable guidelines described in the former Williams AFB Performance Based Remediation Program QAPP and standard operating procedures (SOPs) (collectively referred to as the QAPP/SOP [AMEC, 2012]) for U.S. States Environmental Protection Agency (EPA) Method 300.0.

3.0 SAMPLE INTEGRITY

Samples within this sample delivery group (SDG), collected from ST012, were submitted to TestAmerica Laboratories (TAL) in Phoenix, Arizona. The samples were submitted for bromide and sulfate by USEPA method E300.0.

Based on the information provided on the cooler receipt forms, samples arrived at the laboratory within temperature and preservation requirements. Completed COC documents are included in the data package.

4.0 SAMPLE IDENTIFICATION

This SDG contains the following water samples:

Site: ST012	
ST012-W11-WG-082914	
ST012-W30-WG-082914	

These samples were collected on August 29,2014.

5.0 SAMPLE QUALIFICATION

Only those components that required qualification of the data are presented in this narrative. All Level II components were within the QC limits; therefore, no qualification was required for the data.

6.0 BROMIDE AND SULFATE (EPA 300.0)

Samples collected from site ST012 were submitted for anions by USEPA Method 300.0. The samples submitted to the TAL-Phoenix laboratory were analyzed for Bromide and Sulfate. A Level II validation was performed on this method and all components were within the SAP/TAL SOP criteria.

6.1 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of bromide and sulfate by USEPA Method E300.0 with the exception of analytes that required dilution. None of the samples reported in this SDG required dilution.

7.0 OVERALL SITE EVALUATION AND PROFESSIONAL JUDGMENT FLAGGING CHANGES

Edits to the DQE qualifiers by professional judgment were not required, and the data are usable as qualified in this data narrative.

8.0 SUMMARY OF DATA QUALITY INDICATORS

This section provides an assessment of the data based on project data quality indicators (DQIs) described on QAPP Worksheet #37 of the QAPP/SOP (AMEC, 2012). The DQIs consist of precision, accuracy, representativeness, comparability, completeness, and sensitivity.

8.1 Precision

An assessment of precision of analytical data is accomplished via review of field duplicate and MS/MSD analyses. Field duplicate and MS/MSD analyses are used to assess field variability, which includes sample collection/handling as well as matrix homogeneity. Precision is expressed as the relative percent difference (RPD) between results for duplicate pairs.

No field duplicate or project specific samples were submitted for MS/MSD analyses in the SDG; however, the laboratory analyzed a LCS/LCSD and a MS/MSD on a non-project sample for batch precision. Duplicate precision for anions was within QC limits; therefore, overall method and sample matrix precision are acceptable and achieve project objectives.

8.2 Accuracy (Bias)

An assessment of accuracy of analytical data is accomplished via evaluation of the spike recoveries in the MS/MSD, LCS, post digestion spike samples, and surrogate spike compounds, in addition to calibration criteria. Accuracy is expressed as percent recovery. Accuracy data were compliant with the program document QAPP/SOP, as all associated LCS/LCSD recoveries were within control. Therefore, the data results indicate method and matrix accuracy is acceptable to achieve project objectives.

8.3 Representativeness

Representativeness for the analytical data is determined through evaluation of the associated blank data and evaluation of appropriate sample handling procedures. All samples were properly stored and preserved in the field and at TestAmerica and blanks were all non-detect. The analytical results indicate sample data are representative of the Site conditions.

8.4 Comparability

Comparability addresses the confidence with which one data set can be compared to another. Use of appropriate sampling methods, COC procedures, and EPA-approved analytical methods, as well as adherence to strict QA/QC procedures, provide the basis for uniformity in sample collection and analysis. Analytical data were generated by TestAmerica using standard reporting units of milligrams per liter and methods for all parameters. In addition, sample collection and analytical method protocols were implemented in accordance with approved, documented procedures. Analytical data are determined to be comparable to previous Site results.

8.5 Completeness

Completeness of the field sampling activities were assessed in terms of the actual number and type of sample results received from the field and laboratory, as compared with the planned number and type of sample results. All samples planned were collected which meets a field completeness of 100%.

Analytical completeness of data is a measure of the number of valid project-specific data results obtained in comparison to the total number of data results projected to achieve project DQOs. Valid data are defined as data that meet the project-specific DQOs. No data were rejected as a result of the data validation. The completeness goals met the 90 percent goal for field and laboratory data expected for this project.

8.6 Sensitivity

Analytical methods and LOQs were implemented in accordance with the QAPP/SOP and EPA promulgated methodologies. Method RLs were achieved for the event ; therefore, sensitivity requirements were met.

8.7 Usability Summary

The data generated during the August 2014 sampling event did not require qualification and the analytical results indicate sample data is representative of the Site conditions. The DQOs for the Enhanced Bioremediation Field Test is to produce data to support design of anaerobic methods for the ST012 remedy if selected.

9.0 REFERENCES

AFCEE, 2005. Quality Assurance Project Plan, Version 4.0.01, May, 2005.

AMEC, August 11, 2014. *Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) (Enhanced Bioremediation Field Test Plan) Operable Unit 2 Site ST012 - Liquid Fuels Storage Area, Former Williams Air Force Base, Mesa, Arizona.*

AMEC, February 23, 2012. *Performance Based Remediation Program Quality Assurance Project Plan (QAPP) and Standard Operating Procedures (SOPs) (QAP/SOP), Former Williams Air Force Base, Mesa, Arizona.*

DoD, 2010. Department of Defense Quality System Manual, Version 4.2 Final, October 2010.

Prepared/Date: TDN 10/21/2014
Checked/Date: JAH 10/21/2014

Flagged Data Reports

TDN 10/23/14

Client Sample Results

Client: AMEC Environment & Infrastructure, Inc.
Project/Site: FWAFB ST012 EBR

TestAmerica Job ID: 550-30706-1

Client Sample ID: ST012-W30-WG-082914

Lab Sample ID: 550-30706-1

Date Collected: 08/29/14 11:43
Date Received: 08/29/14 16:03

Matrix: Water

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	3.9		0.50		mg/L			09/02/14 20:43	1
Sulfate	24		2.0		mg/L			09/02/14 20:43	1

Client Sample ID: ST012-W11-WG-082914

Lab Sample ID: 550-30706-2

Date Collected: 08/29/14 13:12
Date Received: 08/29/14 16:03

Matrix: Water

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	1.5		0.50		mg/L			09/02/14 21:19	1
Sulfate	14		2.0		mg/L			09/02/14 21:19	1

Data Quality Evaluation Checklists

Method Validated: 300.0 | Initial Review by: T. Noreikas | Date: 10/21/2014 | SDG#: 550-30706-1
Senior Review by: J. Hartness | Date: 10/21/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	ok
Limit of Detection Determination and Verification (LOD) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOD verification checks shall be performed (see box D-13)	See 40 CFR 1368. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL / LOD verification check at higher level and set MDL higher or reconduct MDL study (see box D-13).	NA	Samples cannot be analyzed without a valid MDL.	Level II
Limit of Quantitation Establishment and Verification (LOQ) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOQ verification checks shall be performed (see box D-14)	Within calibration range including low standard; within method precision and accuracy.	Re-run LOQ	NA	Samples cannot be analyzed without a valid LOQ	Level II

Method Validated: 300.0 Initial Review by: T. Noreikas Date: 10/21/2014 SDG#: 550-30706-1
Senior Review by: J. Hartness Date: 10/21/2014 Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time (RT) Window Width Calculated for Each Analyte and Surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 24-hour study.	NA	NA		Level II
Container, Preservation, and Holding Time	All field samples	500 ml poly, Cool to 4°C Nitrate – 48 hours Nitrite, sulfate, chloride – 28 days	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collected: 8/29/14 Temp: 1.3°C OK Bromide and Sulfate Analyzed: 9/2/14 OK
ICAL for All Analytes (Minimum Three Standards and One Calibration Blank)	Initial calibration prior to sample analysis	R ≥ 0.995	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.	Level II
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 10% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	Level II
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL and at the beginning of the analytical shift	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift.	NA	NA		Level II

Method Validated: 300.0 Initial Review by: T. Noreikas Date: 10/21/2014 SDG#: 550-30706-1
Senior Review by: J. Hartness Date: 10/21/2014 Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Midrange Continuing Calibration Verification (CCV)	After every 10 field samples and at end of the analysis sequence.	All analytes within established retention time windows and within ± 10% of true value	Correct problem then repeat CCV. If that fails, then repeat ICAL. Reanalyze all samples since last successful calibration verification.	Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification, if . reanalysis is not possible.	No samples may be analyzed until the problem has been corrected.	Level II
Method Blank	One per preparatory batch	No analytes detected > ½ RL. See box D-1.	Correct problem, then see criteria in box D-1; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	Lab: Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch. Validator; Apply "B" flag if result is less than 5x method blank.		p. 8 Bromide and Sulfate MB 550-43571/2= ND
Laboratory Control Sample (LCS) Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	Use laboratory in-house LCS acceptance criteria (not to exceed 20%).See Box D-3.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix G)	If corrective action fails apply J-flag to specific analyte(s) in all samples in the associated preparatory batch		p. 8 Bromide and Sulfate LCS/LCSD 550-43571/5 & 6 All ok

Method Validated: 300.0 | Initial Review by: T. Noreikas | Date: 10/21/2014 | SDG#: 550-30706-1
Senior Review by: J. Hartness | Date: 10/21/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Matrix Spike (MS)	One MS per preparatory batch per matrix (see box D- 7)	For matrix evaluation, use laboratory in-house LCS acceptance criteria (not to exceed 20%).	Examine the project-specific 000s. Contact the client as to additional measures to be taken,	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	MS/MSD listed is not a project specified sample 550-30742-1 = OK
Matrix Spike Duplicate (MSD) or Sample Duplicate	One per preparatory batch per matrix	RPD ≤15% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	See above
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤10%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		No field duplicates submitted with this SDG
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between LOD and LOQ. Validator flags: If using AFCEE; Apply "F" flag		No samples reported between LOD and LOQ
QC Blanks (Equipment Blanks and Field Blanks)	Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B".		Not collected

Data Evaluation Narrative
AMEC Project: Former Williams AFB
AMEC Project Number: 9101110001.5300.5301
Site: ST012 – Enhanced Bioremediation Field Test
Sampling Event: September 2014
Matrix: Groundwater

SDG: 550-31025-1

1.0 INTRODUCTION

A data quality evaluation (DQE) was performed on the data reported for the Enhanced Bioremediation Field Test conducted at Site ST012 in September 2014 at the former Williams Air Force Base (WAFB), located in Mesa, Arizona. The following sections provide summary discussions of the required data qualifications for each site and analytical methods for samples collected at the former WAFB. Data validation was conducted on 100% of the primary samples and field quality control samples (rinsate blanks and laboratory control sample/laboratory control sample duplicate [LCS/LCSD] samples). A Level II DQE was performed using supplemental checklists to review the following quality control elements: laboratory case narrative, sample documentation, chain-of-custody, holding time protocols, method blank results, laboratory control sample (LCS) results, surrogate recoveries (where applicable), method sensitivity, and completeness.

Data was reviewed using precision and accuracy control limits presented in The Department of Defense (DoD) Quality Systems Manual (QSM) Version 4.2 (DoD, 2010). DQE data qualifications were applied if necessary in accordance with procedures in Air Force Center for Environmental Excellence (AFCEE) Quality Assurance Project Plan (QAPP), Version 4.0.01 (AFCEE, 2005), the method, and professional judgment using the following qualifiers:

J = The reported concentration is considered an estimated value due to discrepancies in meeting certain analyte-specific quality control criteria.
F = The reported concentration is between the reporting limit (RL) and method detection limit (MDL) and is considered an estimated value
UJ = The target compound was not detected and the reporting limit is considered imprecise due to discrepancies in meeting certain analyte-specific quality control criteria.
B = The result may be biased high or a false positive based on blank data.
M = The reported concentration is estimated due to matrix effects.
R = The data are considered unusable due to discrepancies in meeting certain quality control criteria and may not be used in decision making.

2.0 DELIVERABLES

The data packages as submitted to AMEC Environment and Infrastructure, Inc. (AMEC) are complete as stipulated in the Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) for Site ST012 Enhanced Bioremediation Field Test Plan (AMEC, 2014), and the applicable guidelines described in the former Williams AFB Performance Based Remediation Program QAPP and standard operating procedures (SOPs) (collectively referred to as the QAPP/SOP [AMEC, 2012]) for U.S. States Environmental Protection Agency (EPA) Method 300.0.

3.0 SAMPLE INTEGRITY

Samples within this sample delivery group (SDG), collected from ST012, were submitted to TestAmerica Laboratories (TAL) in Phoenix, Arizona. The samples were submitted for bromide and sulfate by USEPA method E300.0.

Based on the information provided on the cooler receipt forms, samples arrived at the laboratory within temperature and preservation requirements. Completed COC documents are included in the data package.

4.0 SAMPLE IDENTIFICATION

This SDG contains the following water samples:

Site: ST012	
ST012-W11-WG-1000GAL	
ST012-W30-WG-500GAL	

These samples were collected on September 4, 2014.

5.0 SAMPLE QUALIFICATION

Only those components that required qualification of the data are presented in this narrative. All Level II components were within the QC limits; therefore, no qualification was required for the data.

6.0 BROMIDE AND SULFATE (EPA 300.0)

Samples collected from site ST012 were submitted for anions by USEPA Method 300.0. The samples submitted to the TAL-Phoenix laboratory were analyzed for Bromide and Sulfate. A Level II validation was performed on this method and all components were within the SAP/TAL SOP criteria.

6.1 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of bromide and sulfate by USEPA Method E300.0 with the exception of analytes that required dilution. Sulfate in each sample required a 20x dilution.

7.0 OVERALL SITE EVALUATION AND PROFESSIONAL JUDGMENT FLAGGING CHANGES

Edits to the DQE qualifiers by professional judgment were not required, and the data are usable as qualified in this data narrative.

8.0 SUMMARY OF DATA QUALITY INDICATORS

This section provides an assessment of the data based on project data quality indicators (DQIs) described on QAPP Worksheet #37 of the QAPP/SOP (AMEC, 2012). The DQIs consist of precision, accuracy, representativeness, comparability, completeness, and sensitivity.

8.1 Precision

An assessment of precision of analytical data is accomplished via review of field duplicate and MS/MSD analyses. Field duplicate and MS/MSD analyses are used to assess field variability, which includes sample collection/handling as well as matrix homogeneity. Precision is expressed as the relative percent difference (RPD) between results for duplicate pairs.

No field duplicate or project specific samples were submitted for MS/MSD analyses in the SDG; however, the laboratory analyzed a LCS/LCSD and a MS/MSD on a non-project sample for batch precision. Duplicate precision for anions was within QC limits; therefore, overall method and sample matrix precision are acceptable and achieve project objectives.

8.2 Accuracy (Bias)

An assessment of accuracy of analytical data is accomplished via evaluation of the spike recoveries in the MS/MSD, LCS, post digestion spike samples, and surrogate spike compounds, in addition to calibration criteria. Accuracy is expressed as percent recovery. Accuracy data were compliant with the program document QAPP/SOP, as all associated LCS/LCSD recoveries were within control. Therefore, the data results indicate method and matrix accuracy is acceptable to achieve project objectives.

8.3 Representativeness

Representativeness for the analytical data is determined through evaluation of the associated blank data and evaluation of appropriate sample handling procedures. All samples were properly stored and preserved in the field and at TestAmerica and blanks were all non-detect. The analytical results indicate sample data are representative of the Site conditions.

8.4 Comparability

Comparability addresses the confidence with which one data set can be compared to another. Use of appropriate sampling methods, COC procedures, and EPA-approved analytical methods, as well as adherence to strict QA/QC procedures, provide the basis for uniformity in sample collection and analysis. Analytical data were generated by TestAmerica using standard reporting units of milligrams per liter and methods for all parameters. In addition, sample collection and analytical method protocols were implemented in accordance with approved, documented procedures. Analytical data are determined to be comparable to previous Site results.

8.5 Completeness

Completeness of the field sampling activities were assessed in terms of the actual number and type of sample results received from the field and laboratory, as compared with the planned number and type of sample results. All samples planned were collected which meets a field completeness of 100%.

Analytical completeness of data is a measure of the number of valid project-specific data results obtained in comparison to the total number of data results projected to achieve project DQOs. Valid data are defined as data that meet the project-specific DQOs. No data were rejected as a result of the data validation. The completeness goals met the 90 percent goal for field and laboratory data expected for this project.

8.6 Sensitivity

Analytical methods and LOQs were implemented in accordance with the QAPP/SOP and EPA promulgated methodologies except where constituents required dilution to place the results within the calibration range. As previously mentioned, sulfate required dilution in each sample; however, for the undiluted constituents, sensitivity requirements were met.

8.7 Usability Summary

The data generated during the September 2014 sampling event did not require qualification and the analytical results indicate sample data is representative of the Site conditions. The DQOs for the Enhanced Bioremediation Field Test is to produce data to support design of anaerobic methods for the ST012 remedy if selected.

9.0 REFERENCES

AFCEE, 2005. Quality Assurance Project Plan, Version 4.0.01, May, 2005.

AMEC, August 11, 2014. *Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) (Enhanced Bioremediation Field Test Plan) Operable Unit 2 Site ST012 - Liquid Fuels Storage Area, Former Williams Air Force Base, Mesa, Arizona.*

AMEC, February 23, 2012. *Performance Based Remediation Program Quality Assurance Project Plan (QAPP) and Standard Operating Procedures (SOPs) (QAP/SOP), Former Williams Air Force Base, Mesa, Arizona.*

DoD, 2010. Department of Defense Quality System Manual, Version 4.2 Final, October 2010.

Prepared/Date: DLH 11/19/2014
Checked/Date: JAH 11/24/14

Flagged Data Reports

Client Sample Results

Client: AMEC Environment & Infrastructure, Inc.
Project/Site: FWAFB ST012

TestAmerica Job ID: 550-31025-1

Client Sample ID: ST012-W11-WG-500gal

Lab Sample ID: 550-31025-1

Date Collected: 09/04/14 15:05
Date Received: 09/04/14 17:48

Matrix: Water

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	2.9		0.50		mg/L			09/05/14 20:34	1
Sulfate	260		40		mg/L			09/05/14 20:52	20

Client Sample ID: ST012-W11-WG-1000gal

Lab Sample ID: 550-31025-2

Date Collected: 09/04/14 16:41
Date Received: 09/04/14 17:48

Matrix: Water

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	2.8		0.50		mg/L			09/05/14 21:10	1
Sulfate	260		40		mg/L			09/05/14 21:29	20

Data Quality Evaluation Checklists

Method Validated: 300.0 | Initial Review by: D. Howard | Date: 11/19/14 | SDG#: 550-31025-1
Senior Review by: J. Hartness | Date: 11/24/14 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	ok
Limit of Detection Determination and Verification (LOD) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOD verification checks shall be performed (see box D-13)	See 40 CFR 1368. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL / LOD verification check at higher level and set MDL higher or reconduct MDL study (see box D-13).	NA	Samples cannot be analyzed without a valid MDL.	Level II
Limit of Quantitation Establishment and Verification (LOQ) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOQ verification checks shall be performed (see box D-14)	Within calibration range including low standard; within method precision and accuracy.	Re-run LOQ	NA	Samples cannot be analyzed without a valid LOQ	Level II

Method Validated: 300.0 | Initial Review by: D. Howard | Date: 11/19/14 | SDG#: 550-31025-1
Senior Review by: J. Hartness | Date: 11/24/14 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time (RT) Window Width Calculated for Each Analyte and Surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 24-hour study.	NA	NA		Level II
Container, Preservation, and Holding Time	All field samples	500 ml poly, Cool to 4°C Nitrate – 48 hours Nitrite, sulfate, chloride – 28 days	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collected: 9/4/14 Temp: 2.0°C OK Bromide and Sulfate Analyzed: 9/5/14 OK
ICAL for All Analytes (Minimum Three Standards and One Calibration Blank)	Initial calibration prior to sample analysis	R ≥ 0.995	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.	Level II
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 10% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	Level II
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL and at the beginning of the analytical shift	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift.	NA	NA		Level II

Method Validated: 300.0 Initial Review by: D. Howard Date: 11/19/14 SDG#: 550-31025-1
Senior Review by: J. Hartness Date: 11/24/14 Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Midrange Continuing Calibration Verification (CCV)	After every 10 field samples and at end of the analysis sequence.	All analytes within established retention time windows and within ± 10% of true value	Correct problem then repeat CCV. If that fails, then repeat ICAL. Reanalyze all samples since last successful calibration verification.	Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification, if . reanalysis is not possible.	No samples may be analyzed until the problem has been corrected.	Level II
Method Blank	One per preparatory batch	No analytes detected > ½ RL. See box D-1.	Correct problem, then see criteria in box D-1; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	Lab: Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch. Validator; Apply "B" flag if result is less than 5x method blank.		p. 8 Bromide and Sulfate MB 550-43923/2= ND
Laboratory Control Sample (LCS) Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	Use laboratory in-house LCS acceptance criteria (not to exceed 20%).See Box D-3.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix G)	If corrective action fails apply J-flag to specific analyte(s) in all samples in the associated preparatory batch		p. 8 Bromide and Sulfate LCS/LCSD 550-43923/5,6 All ok

Method Validated: 300.0 | Initial Review by: D. Howard | Date: 11/19/14 | SDG#: 550-31025-1
Senior Review by: J. Hartness | Date: 11/24/14 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Matrix Spike (MS)	One MS per preparatory batch per matrix (see box D- 7)	For matrix evaluation, use laboratory in-house LCS acceptance criteria (not to exceed 20%).	Examine the project-specific 000s. Contact the client as to additional measures to be taken,	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	p. 8 MS/MSD listed is not a project specified sample 550-31023-A-2MS/MSD ^T OK
Matrix Spike Duplicate (MSD) or Sample Duplicate	One per preparatory batch per matrix	RPD ≤15% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	See above
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤10%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		No field duplicates submitted with this SDG
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between LOD and LOQ. Validator flags: If using AFCEE; Apply "F" flag		No samples reported between LOD and LOQ
QC Blanks (Equipment Blanks and Field Blanks)	Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B".		Not collected

Data Evaluation Narrative
AMEC Project: Former Williams AFB
AMEC Project Number: 9101110001.5300.5301
Site: ST012 – Enhanced Bioremediation Field Test
Sampling Event: September 2014
Matrix: Groundwater

SDG: 550-31115-1

1.0 INTRODUCTION

A data quality evaluation (DQE) was performed on the data reported for the Enhanced Bioremediation Field Test conducted at Site ST012 in September 2014 at the former Williams Air Force Base (WAFB), located in Mesa, Arizona. The following sections provide summary discussions of the required data qualifications for each site and analytical methods for samples collected at the former WAFB. Data validation was conducted on 100% of the primary samples and field quality control samples (rinsate blanks and laboratory control sample/laboratory control sample duplicate [LCS/LCSD] samples). Data validation was performed using supplemental checklists to review the following quality control elements. A Level II DQE was performed on the analyses using the following criteria: laboratory case narrative, sample documentation, chain-of-custody, holding time protocols, method blank results, laboratory control sample (LCS) results, surrogate recoveries (where applicable), method sensitivity, and completeness.

Data was reviewed using precision and accuracy control limits presented in The Department of Defense (DoD) Quality Systems Manual (QSM) Version 4.2 (DoD, 2010). DQE data qualifications were applied if necessary in accordance with procedures in Air Force Center for Environmental Excellence (AFCEE) Quality Assurance Project Plan (QAPP), Version 4.0.01 (AFCEE, 2005), the method, and professional judgment using the following qualifiers:

J = The reported concentration is considered an estimated value due to discrepancies in meeting certain analyte-specific quality control criteria.
F = The reported concentration is between the reporting limit (RL) and method detection limit (MDL) and is considered an estimated value
UJ = The target compound was not detected and the reporting limit is considered imprecise due to discrepancies in meeting certain analyte-specific quality control criteria.
B = The result may be biased high or a false positive based on blank data.
M = The reported concentration is estimated due to matrix effects.
R = The data are considered unusable due to discrepancies in meeting certain quality control criteria and may not be used in decision making.

2.0 DELIVERABLES

The data packages as submitted to AMEC Environment and Infrastructure, Inc. (AMEC) are complete as stipulated in the Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) for Site ST012 Enhanced Bioremediation Field Test Plan (AMEC, 2014), and the applicable guidelines described in the former Williams AFB Performance Based Remediation Program QAPP and standard operating procedures (SOPs) (collectively referred to as the QAPP/SOP [AMEC, 2012]) for U.S. States Environmental Protection Agency (EPA) Method 300.0.

3.0 SAMPLE INTEGRITY

Samples within this sample delivery group (SDG), collected from ST012, were submitted to TestAmerica Laboratories (TAL) in Phoenix, Arizona. The samples were submitted for bromide and sulfate by USEPA Method E300.0.

Based on the information provided on the cooler receipt forms, samples arrived at the laboratory within temperature and preservation requirements. Completed COC documents are included in the data package.

4.0 SAMPLE IDENTIFICATION

This SDG contains the following water and quality control (QC) samples:

Site: ST012	
ST012-W11-EBR-X-1674	ST012-W11-EBR-X-6000
ST012-W11-EBR-X-2004	ST012-W11-EBR-X-6500
ST012-W11-EBR-X-2500	ST012-W11-EBR-X-7000
ST012-W11-EBR-X-3000	ST012-W11-EBR-X-7500
ST012-W11-EBR-X-3500	ST012-W11-EBR-X-8000
ST012-W11-EBR-X-500	ST012-W11-EBR-X-8500
ST012-W11-EBR-X-4500	ST012-W11-EBR-X-9000
ST012-W11-EBR-X-5000	ST012-W11-EBR-X-9500
ST012-W11-EBR-X-5500	ST012-W11-EBR-X-10000

These samples were collected on September 6-8, 2014. The laboratory performed a matrix spike/matrix spike duplicate analysis on sample ST012-W11-EBR-X-1674.

5.0 SAMPLE QUALIFICATION

Only those components that required qualification of the data are presented in this narrative. All Level II components were within the QC limits; however, the following was noted:

- MS/MSD recoveries exceeded QC limits (no qualification required).

6.0 BROMIDE AND SULFATE (EPA 300.0)

Samples collected from site ST012 were submitted for bromide and sulfate by Method E300.0. A Level II validation was performed on this method and all components were within the QAPP/SOP criteria.

6.1 Matrix Spike/Matrix Spike Duplicate

The laboratory performed a MS/MSD on sample ST012-W11-EBR-X-1674 and the recoveries for sulfate exceeded the QC limits.

Action: No qualification was required because sulfate was present in the parent sample at a concentration greater than 4x the spike amount. In addition, the sample was analyzed at a dilution and the recoveries for sulfate fell within the QC limits.

6.2 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of bromide and sulfate by USEPA Method E300.0 with the exception of analytes that required dilution. Dilutions were required for sulfate in the samples reported in this SDG.

7.0 OVERALL SITE EVALUATION AND PROFESSIONAL JUDGMENT FLAGGING CHANGES

Edits to the DQE qualifiers by professional judgment were not required, and the data are usable as qualified in this data narrative.

8.0 SUMMARY OF DATA QUALITY INDICATORS

This section provides an assessment of the data based on project data quality indicators (DQIs) described on QAPP Worksheet #37 of the QAPP/SOP (AMEC, 2012). The DQIs consist of precision, accuracy, representativeness, comparability, completeness, and sensitivity.

8.1 Precision

An assessment of precision of analytical data is accomplished via review of field duplicate and MS/MSD analyses. Field duplicate and MS/MSD analyses are used to assess field variability, which includes sample collection/handling as well as matrix homogeneity. Precision is expressed as the relative percent difference (RPD) between results for duplicate pairs.

No field duplicate samples were submitted analyses in the SDG; however, the laboratory analyzed a LCS/LCSD and a MS/MSD on a project sample for batch precision. Duplicate precision for anions was within QC limits; therefore, overall method and sample matrix precision are acceptable and achieve project objectives.

8.2 Accuracy (Bias)

An assessment of accuracy of analytical data is accomplished via evaluation of the spike recoveries in the MS/MSD, LCS, post digestion spike samples, and surrogate spike compounds, in addition to calibration criteria. Accuracy is expressed as percent recovery. Accuracy data were compliant with the program document QAPP/SOP, as all associated LCS/LCSD recoveries were within control. Therefore, the data results indicate method and matrix accuracy is acceptable to achieve project objectives.

8.3 Representativeness

Representativeness for the analytical data is determined through evaluation of the associated blank data and evaluation of appropriate sample handling procedures. All samples were properly stored and preserved in the field and at TestAmerica and blanks were all non-detect. The analytical results indicate sample data are representative of the Site conditions.

8.4 Comparability

Comparability addresses the confidence with which one data set can be compared to another. Use of appropriate sampling methods, COC procedures, and EPA-approved analytical methods, as well as adherence to strict QA/QC procedures, provide the basis for uniformity in sample collection and analysis. Analytical data were generated by TestAmerica using standard reporting units of milligrams per liter and methods for the parameters. In addition, sample collection and analytical method protocols were implemented in accordance with approved, documented procedures. Analytical data are determined to be comparable to previous Site results.

8.5 Completeness

Completeness of the field sampling activities were assessed in terms of the actual number and type of sample results received from the field and laboratory, as compared with the planned number and type of sample results. All samples planned were collected which meets a field completeness of 100%.

Analytical completeness of data is a measure of the number of valid project-specific data results obtained in comparison to the total number of data results projected to achieve project DQOs. Valid data are defined as data that meet the project-specific DQOs. No data were rejected as a result of the data validation. The completeness goals met the 90 percent goal for field and laboratory data expected for this project.

8.6 Sensitivity

Analytical methods and LOQs were implemented in accordance with the QAPP/SOP and EPA promulgated methodologies except where dilutions were required. Dilutions were required for sulfate resulting in elevated LOQs; however, method RLs were achieved for bromide and sensitivity requirements were met.

8.7 Usability Summary

The data generated during the September 2014 sampling event did not require qualification and the analytical results indicate sample data is representative of the Site conditions. The DQOs for the Enhanced Bioremediation Field Test is to produce data to support design of anaerobic methods for the ST012 remedy if selected.

9.0 REFERENCES

AFCEE, 2005. Quality Assurance Project Plan, Version 4.0.01, May, 2005.

AMEC, August 11, 2014. *Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) (Enhanced Bioremediation Field Test Plan) Operable Unit 2 Site ST012 - Liquid Fuels Storage Area, Former Williams Air Force Base, Mesa, Arizona*.

AMEC, February 23, 2012. *Performance Based Remediation Program Quality Assurance Project Plan (QAPP) and Standard Operating Procedures (SOPs) (QAP/SOP), Former Williams Air Force Base, Mesa, Arizona*.

DoD, 2010. Department of Defense Quality System Manual, Version 4.2 Final, October 2010.

Prepared/Date: DWK 9/22/2014
Checked/Date: JAH 9/22/2014

Flagged Data Reports

Due 9-22-14 No Flags

Client Sample Results

Client: AMEC Environment & Infrastructure, Inc.
Project/Site: WAFB

TestAmerica Job ID: 550-31115-1
SDG: ST012 EBR

Client Sample ID: ST012-W11-EBR-X-1674

Lab Sample ID: 550-31115-1
Matrix: Water

Date Collected: 09/06/14 21:47
Date Received: 09/08/14 11:36

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	2.6		0.50		mg/L			09/08/14 15:40	1
Sulfate	320		40		mg/L			09/08/14 16:36	20

Client Sample ID: ST012-W11-EBR-X-2004

Lab Sample ID: 550-31115-2
Matrix: Water

Date Collected: 09/06/14 22:48
Date Received: 09/08/14 11:36

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	2.6		0.50		mg/L			09/08/14 16:54	1
Sulfate	260		40		mg/L			09/08/14 17:12	20

Client Sample ID: ST012-W11-EBR-X-2500

Lab Sample ID: 550-31115-3
Matrix: Water

Date Collected: 09/07/14 00:23
Date Received: 09/08/14 11:36

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	2.6		0.50		mg/L			09/08/14 17:31	1
Sulfate	270		40		mg/L			09/08/14 17:49	20

Client Sample ID: ST012-W11-EBR-X-3000

Lab Sample ID: 550-31115-4
Matrix: Water

Date Collected: 09/07/14 01:55
Date Received: 09/08/14 11:36

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	2.6		0.50		mg/L			09/08/14 18:08	1
Sulfate	270		40		mg/L			09/08/14 18:26	20

Client Sample ID: ST012-W11-EBR-X-3500

Lab Sample ID: 550-31115-5
Matrix: Water

Date Collected: 09/07/14 03:30
Date Received: 09/08/14 11:36

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	2.6		0.50		mg/L			09/08/14 19:21	1
Sulfate	270		40		mg/L			09/08/14 19:40	20

Client Sample ID: ST012-W11-EBR-X-4000

Lab Sample ID: 550-31115-6
Matrix: Water

Date Collected: 09/07/14 05:03
Date Received: 09/08/14 11:36

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	2.6		0.50		mg/L			09/08/14 19:58	1
Sulfate	280		40		mg/L			09/08/14 20:17	20

DWK 9-22-14 No flags

Client Sample Results

Client: AMEC Environment & Infrastructure, Inc.
Project/Site: WAFB

TestAmerica Job ID: 550-31115-1
SDG: ST012 EBR

Client Sample ID: ST012-W30-EBR-X-500

Lab Sample ID: 550-31115-7
Matrix: Water

Date Collected: 09/07/14 06:05
Date Received: 09/08/14 11:36

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	2.7		0.50		mg/L			09/08/14 20:35	1
Sulfate	18		2.0		mg/L			09/08/14 20:35	1

Client Sample ID: ST012-W11-EBR-X-4500

Lab Sample ID: 550-31115-8
Matrix: Water

Date Collected: 09/07/14 06:35
Date Received: 09/08/14 11:36

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	2.6		0.50		mg/L			09/08/14 21:12	1
Sulfate	280		40		mg/L			09/08/14 21:30	20

Client Sample ID: ST012-W11-EBR-X-5000

Lab Sample ID: 550-31115-9
Matrix: Water

Date Collected: 09/07/14 08:26
Date Received: 09/08/14 11:36

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	2.6		0.50		mg/L			09/08/14 21:49	1
Sulfate	280		40		mg/L			09/08/14 22:07	20

Client Sample ID: ST012-W11-EBR-X-5500

Lab Sample ID: 550-31115-10
Matrix: Water

Date Collected: 09/07/14 09:57
Date Received: 09/08/14 11:36

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	2.6		0.50		mg/L			09/08/14 23:02	1
Sulfate	280		40		mg/L			09/08/14 23:21	20

Client Sample ID: ST012-W11-EBR-X-6000

Lab Sample ID: 550-31115-11
Matrix: Water

Date Collected: 09/07/14 11:29
Date Received: 09/08/14 11:36

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	2.5		0.50		mg/L			09/08/14 23:39	1
Sulfate	280		40		mg/L			09/08/14 23:57	20

Client Sample ID: ST012-W11-EBR-X-6500

Lab Sample ID: 550-31115-12
Matrix: Water

Date Collected: 09/07/14 13:43
Date Received: 09/08/14 11:36

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	2.5		0.50		mg/L			09/09/14 00:16	1
Sulfate	280		40		mg/L			09/09/14 00:34	20

DWK 9-22-14 No flags

Client Sample Results

Client: AMEC Environment & Infrastructure, Inc.
Project/Site: WAFB

TestAmerica Job ID: 550-31115-1
SDG: ST012 EBR

Client Sample ID: ST012-W11-EBR-X-7000

Lab Sample ID: 550-31115-13
Matrix: Water

Date Collected: 09/07/14 15:25
Date Received: 09/08/14 11:36

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	2.5		0.50		mg/L			09/09/14 00:53	1
Sulfate	280		40		mg/L			09/09/14 01:11	20

Client Sample ID: ST012-W11-EBR-X-7500

Lab Sample ID: 550-31115-14
Matrix: Water

Date Collected: 09/07/14 17:00
Date Received: 09/08/14 11:36

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	2.5		0.50		mg/L			09/09/14 01:29	1
Sulfate	280		40		mg/L			09/09/14 01:48	20

Client Sample ID: ST012-W11-EBR-X-8000

Lab Sample ID: 550-31115-15
Matrix: Water

Date Collected: 09/07/14 18:33
Date Received: 09/08/14 11:36

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	2.6		0.50		mg/L			09/08/14 22:54	1
Sulfate	140		20		mg/L			09/08/14 23:22	10

Client Sample ID: ST012-W11-EBR-X-8500

Lab Sample ID: 550-31115-16
Matrix: Water

Date Collected: 09/07/14 20:18
Date Received: 09/08/14 11:36

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	2.7		0.50		mg/L			09/08/14 23:50	1
Sulfate	280		40		mg/L			09/09/14 00:18	20

Client Sample ID: ST012-W11-EBR-X-9000

Lab Sample ID: 550-31115-17
Matrix: Water

Date Collected: 09/07/14 21:54
Date Received: 09/08/14 11:36

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	2.7		0.50		mg/L			09/09/14 00:46	1
Sulfate	280		40		mg/L			09/09/14 01:14	20

Client Sample ID: ST012-W11-EBR-X-9500

Lab Sample ID: 550-31115-18
Matrix: Water

Date Collected: 09/07/14 23:33
Date Received: 09/08/14 11:36

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	2.7		0.50		mg/L			09/09/14 01:42	1
Sulfate	280		40		mg/L			09/09/14 02:10	20

Client: AMEC Environment & Infrastructure, Inc.
Project/Site: WAFB

TestAmerica Job ID: 550-31115-1
SDG: ST012 EBR

Client Sample ID: ST012-W11-EBR-X-10000
Date Collected: 09/08/14 01:10
Date Received: 09/08/14 11:36

Lab Sample ID: 550-31115-19
Matrix: Water

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	2.7		0.50		mg/L			09/09/14 02:38	1
Sulfate	280		40		mg/L			09/09/14 03:06	20

Data Quality Evaluation Checklists

Method Validated: 300.0 | Initial Review by: D. Knaub | Date: 9/22/2014 | SDG#: 550-31115-1
Senior Review by: J. Hartness | Date: 9/22/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	ok
Limit of Detection Determination and Verification (LOD) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOD verification checks shall be performed (see box D-13)	See 40 CFR 1368. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL / LOD verification check at higher level and set MDL higher or reconduct MDL study (see box D-13).	NA	Samples cannot be analyzed without a valid MDL.	Level II
Limit of Quantitation Establishment and Verification (LOQ) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOQ verification checks shall be performed (see box D-14)	Within calibration range including low standard; within method precision and accuracy.	Re-run LOQ	NA	Samples cannot be analyzed without a valid LOQ	Level II

Method Validated: 300.0 Initial Review by: D. Knaub Date: 9/22/2014 SDG#: 550-31115-1
Senior Review by: J. Hartness Date: 9/22/2014 Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time (RT) Window Width Calculated for Each Analyte and Surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 24-hour study.	NA	NA		Level II
Container, Preservation, and Holding Time	All field samples	500 ml poly, Cool to 4°C Nitrate – 48 hours Nitrite, sulfate, chloride – 28 days	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collected: 9/6/14 , 9/7/14, 9/8/14 Temp: 2.6°C Bromide and Sulfate Analyzed: 9/8/14, 9/9/14 OK
ICAL for All Analytes (Minimum Three Standards and One Calibration Blank)	Initial calibration prior to sample analysis	R ≥ 0.995	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.	Level II
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 10% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	Level II
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL and at the beginning of the analytical shift	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift.	NA	NA		Level II

Method Validated: 300.0 | Initial Review by: D. Knaub | Date: 9/22/2014 | SDG#: 550-31115-1
Senior Review by: J. Hartness | Date: 9/22/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Midrange Continuing Calibration Verification (CCV)	After every 10 field samples and at end of the analysis sequence.	All analytes within established retention time windows and within ± 10% of true value	Correct problem then repeat CCV. If that fails, then repeat ICAL. Reanalyze all samples since last successful calibration verification.	Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification, if . reanalysis is not possible.	No samples may be analyzed until the problem has been corrected.	Level II
Method Blank	One per preparatory batch	No analytes detected > ½ RL. See box D-1.	Correct problem, then see criteria in box D-1; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	Lab: Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch. Validator; Apply "B" flag if result is less than 5x method blank.		p. 13 Bromide and Sulfate MB 550-44034/2= ND p.13 Bromide and Sulfate MB 550-44035/2= ND

Method Validated: 300.0 | Initial Review by: D. Knaub | Date: 9/22/2014 | SDG#: 550-31115-1
Senior Review by: J. Hartness | Date: 9/22/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Laboratory Control Sample (LCS) Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	Use laboratory in-house LCS acceptance criteria (not to exceed 20%).See Box D-3.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix G)	If corrective action fails apply J-flag to specific analyte(s) in all samples in the associated preparatory batch		p. 13 Bromide and Sulfate LCS/LCSD 550-44034/5,6 All ok p.13 & 14 Bromide and Sulfate LCS/LCSD 550-44035/5,6 All ok
Matrix Spike (MS)	One MS per preparatory batch per matrix (see box D- 7)	For matrix evaluation, use laboratory in-house LCS acceptance criteria (not to exceed 20%).	Examine the project-specific 000s. Contact the client as to additional measures to be taken,	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	p.13 & 14 ST012-W11-EBR-X-1674 Sulfate 31% 32% - ***no flag >4x spike amount; diluted MS/MSD was within contrl for SO4***
Matrix Spike Duplicate (MSD) or Sample Duplicate	One per preparatory batch per matrix	RPD ≤15% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	RPDs are OK
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤10%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		No field duplicates submitted with this SDG

Method Validated: 300.0 | Initial Review by: D. Knaub | Date: 9/22/2014 | SDG#: 550-31115-1
Senior Review by: J. Hartness | Date: 9/22/2014 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056/300.0)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between LOD and LOQ. Validator flags: If using AFCEE; Apply "F" flag		No samples reported between LOD and LOQ
QC Blanks (Equipment Blanks and Field Blanks)	Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B".		Not collected

Data Evaluation Narrative
AMEC Project: Former Williams AFB
AMEC Project Number: 9101110001.5300.5301
Site: ST012 – Enhanced Bioremediation Field Test
Sampling Event: September 2014
Matrix: Groundwater

SDG: 550-31313-1

1.0 INTRODUCTION

A data quality evaluation (DQE) was performed on the data reported for the Enhanced Bioremediation Field Test conducted at Site ST012 in September 2014 at the former Williams Air Force Base (WAFB), located in Mesa, Arizona. The following sections provide summary discussions of the required data qualifications for each site and analytical methods for samples collected at the former WAFB. Data validation was conducted on 100% of the primary samples and field quality control samples (rinsate blanks and laboratory control sample/laboratory control sample duplicate [LCS/LCSD] samples). A Level II DQE was performed using supplemental checklists to review the following quality control elements: laboratory case narrative, sample documentation, chain-of-custody, holding time protocols, method blank results, laboratory control sample (LCS) results, surrogate recoveries (where applicable), method sensitivity, and completeness.

Data was reviewed using precision and accuracy control limits presented in The Department of Defense (DoD) Quality Systems Manual (QSM) Version 4.2 (DoD, 2010). DQE data qualifications were applied if necessary in accordance with procedures in Air Force Center for Environmental Excellence (AFCEE) Quality Assurance Project Plan (QAPP), Version 4.0.01 (AFCEE, 2005), the method, and professional judgment using the following qualifiers:

J = The reported concentration is considered an estimated value due to discrepancies in meeting certain analyte-specific quality control criteria.
F = The reported concentration is between the reporting limit (RL) and method detection limit (MDL) and is considered an estimated value
UJ = The target compound was not detected and the reporting limit is considered imprecise due to discrepancies in meeting certain analyte-specific quality control criteria.
B = The result may be biased high or a false positive based on blank data.
M = The reported concentration is estimated due to matrix effects.
R = The data are considered unusable due to discrepancies in meeting certain quality control criteria and may not be used in decision making.

2.0 DELIVERABLES

The data packages as submitted to AMEC Environment and Infrastructure, Inc. (AMEC) are complete as stipulated in the Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) for Site ST012 Enhanced Bioremediation Field Test Plan (AMEC, 2014), and the applicable guidelines described in the former Williams AFB Performance Based Remediation Program QAPP and standard operating procedures (SOPs) (collectively referred to as the QAPP/SOP [AMEC, 2012]) for U.S. States Environmental Protection Agency (EPA) Method 300.0.

3.0 SAMPLE INTEGRITY

Samples within this sample delivery group (SDG), collected from ST012, were submitted to TestAmerica Laboratories (TAL) in Phoenix, Arizona. The samples were submitted for bromide and sulfate by USEPA method E300.0.

Based on the information provided on the cooler receipt forms, samples arrived at the laboratory within temperature and preservation requirements. Completed COC documents are included in the data package.

4.0 SAMPLE IDENTIFICATION

This SDG contains the following water samples:

Site: ST012	
ST012-W30-EBR-X-167	ST012-W30-EBR-X-500-091014
ST012-W30-EBR-X-344	ST012-W30-EBR-X-INT

These samples were collected on September 9 and 10, 2014.

5.0 SAMPLE QUALIFICATION

Only those components that required qualification of the data are presented in this narrative. All Level II components were within the QC limits; therefore, no qualification was required for the data.

6.0 BROMIDE AND SULFATE (EPA 300.0)

Samples collected from site ST012 were submitted for anions by USEPA Method 300.0. The samples submitted to the TAL-Phoenix laboratory were analyzed for Bromide and Sulfate. A Level II validation was performed on this method and all components were within the SAP/TAL SOP criteria.

6.1 Limits of Quantitation

The LOQs as specified in the QAPP/SOP (AMEC, 2012) were met for samples submitted for the analysis of bromide and sulfate by USEPA Method E300.0 with the exception of analytes that required dilution. None of the samples reported in this SDG required dilution.

7.0 OVERALL SITE EVALUATION AND PROFESSIONAL JUDGMENT FLAGGING CHANGES

Edits to the DQE qualifiers by professional judgment were not required, and the data are usable as qualified in this data narrative.

8.0 SUMMARY OF DATA QUALITY INDICATORS

This section provides an assessment of the data based on project data quality indicators (DQIs) described on QAPP Worksheet #37 of the QAPP/SOP (AMEC, 2012). The DQIs consist of precision, accuracy, representativeness, comparability, completeness, and sensitivity.

8.1 Precision

An assessment of precision of analytical data is accomplished via review of field duplicate and MS/MSD analyses. Field duplicate and MS/MSD analyses are used to assess field variability, which includes sample collection/handling as well as matrix homogeneity. Precision is expressed as the relative percent difference (RPD) between results for duplicate pairs.

No field duplicate or project specific samples were submitted for MS/MSD analyses in the SDG; however, the laboratory analyzed a LCS/LCSD and a MS/MSD on a non-project sample for batch precision. Duplicate precision for anions was within QC limits; therefore, overall method and sample matrix precision are acceptable and achieve project objectives.

8.2 Accuracy (Bias)

An assessment of accuracy of analytical data is accomplished via evaluation of the spike recoveries in the MS/MSD, LCS, post digestion spike samples, and surrogate spike compounds, in addition to calibration criteria. Accuracy is expressed as percent recovery. Accuracy data were compliant with the program document QAPP/SOP, as all associated LCS/LCSD recoveries were within control. Therefore, the data results indicate method and matrix accuracy is acceptable to achieve project objectives.

8.3 Representativeness

Representativeness for the analytical data is determined through evaluation of the associated blank data and evaluation of appropriate sample handling procedures. All samples were properly stored and preserved in the field and at TestAmerica and blanks were all non-detect. The analytical results indicate sample data are representative of the Site conditions.

8.4 Comparability

Comparability addresses the confidence with which one data set can be compared to another. Use of appropriate sampling methods, COC procedures, and EPA-approved analytical methods, as well as adherence to strict QA/QC procedures, provide the basis for uniformity in sample collection and analysis. Analytical data were generated by TestAmerica using standard reporting units of milligrams per liter and methods for all parameters. In addition, sample collection and analytical method protocols were implemented in accordance with approved, documented procedures. Analytical data are determined to be comparable to previous Site results.

8.5 Completeness

Completeness of the field sampling activities were assessed in terms of the actual number and type of sample results received from the field and laboratory, as compared with the planned number and type of sample results. All samples planned were collected which meets a field completeness of 100%.

Analytical completeness of data is a measure of the number of valid project-specific data results obtained in comparison to the total number of data results projected to achieve project DQOs. Valid data are defined as data that meet the project-specific DQOs. No data were rejected as a result of the data validation. The completeness goals met the 90 percent goal for field and laboratory data expected for this project.

8.6 Sensitivity

Analytical methods and LOQs were implemented in accordance with the QAPP/SOP and EPA promulgated methodologies. Method RLs were achieved for the event ; therefore, sensitivity requirements were met.

8.7 Usability Summary

The data generated during the September 2014 sampling event did not require qualification and the analytical results indicate sample data is representative of the Site conditions. The DQOs for the Enhanced Bioremediation Field Test is to produce data to support design of anaerobic methods for the ST012 remedy if selected.

9.0 REFERENCES

AFCEE, 2005. Quality Assurance Project Plan, Version 4.0.01, May, 2005.

AMEC, August 11, 2014. *Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) (Enhanced Bioremediation Field Test Plan) Operable Unit 2 Site ST012 - Liquid Fuels Storage Area, Former Williams Air Force Base, Mesa, Arizona.*

AMEC, February 23, 2012. *Performance Based Remediation Program Quality Assurance Project Plan (QAPP) and Standard Operating Procedures (SOPs) (QAP/SOP), Former Williams Air Force Base, Mesa, Arizona.*

DoD, 2010. Department of Defense Quality System Manual, Version 4.2 Final, October 2010.

Prepared/Date: TDN 10/21/2014
Checked/Date: JAH 10/21/2014

Flagged Data Reports

TDN 10/21/14

Client Sample Results

Client: AMEC Environment & Infrastructure, Inc.
Project/Site: FWAFB ST012

TestAmerica Job ID: 550-31313-1
SDG: ST012 EBR

Client Sample ID: ST012-W30-EBR-X-INT

Lab Sample ID: 550-31313-1
Matrix: Water

Date Collected: 09/09/14 08:03
Date Received: 09/10/14 15:13

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	2.3		0.50		mg/L			09/13/14 00:15	1
Sulfate	15		2.0		mg/L			09/13/14 00:15	1

Client Sample ID: ST012-W30-EBR-X-167

Lab Sample ID: 550-31313-2
Matrix: Water

Date Collected: 09/09/14 10:49
Date Received: 09/10/14 15:13

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	2.6		0.50		mg/L			09/13/14 00:52	1
Sulfate	15		2.0		mg/L			09/13/14 00:52	1

Client Sample ID: ST012-W30-EBR-X-344

Lab Sample ID: 550-31313-3
Matrix: Water

Date Collected: 09/09/14 13:45
Date Received: 09/10/14 15:13

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	2.6		0.50		mg/L			09/13/14 01:29	1
Sulfate	19		2.0		mg/L			09/13/14 01:29	1

Client Sample ID: ST012-W30-EBR-X-500

Lab Sample ID: 550-31313-4
Matrix: Water

Date Collected: 09/10/14 10:56
Date Received: 09/10/14 15:13

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	2.4		0.50		mg/L			09/13/14 02:43	1
Sulfate	16		2.0		mg/L			09/13/14 02:43	1

Data Quality Evaluation Checklists

Method Validated: 9056A

Initial Review by: T. Noreikas Date: 10/21/14

Senior Review by: J. Hartness Date: 10/21/14

SDG#: 550-31313-1

Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Demonstrate Acceptable Analyst Capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method (see Appendix C)	QC acceptance criteria published by DoD, if available; otherwise method- specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.	ok
Limit of Detection Determination and Verification (LOD) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOD verification checks shall be performed (see box D-13)	See 40 CFR 1368. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL / LOD verification check at higher level and set MDL higher or reconduct MDL study (see box D-13).	NA	Samples cannot be analyzed without a valid MDL.	Level II
Limit of Quantitation Establishment and Verification (LOQ) Study	At initial set-up and subsequently once per 12 month period; otherwise quarterly LOQ verification checks shall be performed (see box D-14)	Within calibration range including low standard; within method precision and accuracy.	Re-run LOQ	NA	Samples cannot be analyzed without a valid LOQ	Level II

Method Validated: 9056A

Initial Review by: T. Noreikas Date: 10/21/14

Senior Review by: J. Hartness Date: 10/21/14

SDG#: 550-31313-1

Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Retention Time (RT) Window Width Calculated for Each Analyte and Surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 24-hour study.	NA	NA		OK
Container, Preservation, and Holding Time	All field samples	500 ml poly, Cool to 4°C Nitrate – 48 hours Nitrite, sulfate, chloride – 28 days	NA	Samples analyzed outside of holding time or received unpreserved are qualified as estimated and flagged "J" or "UJ"	Use professional judgment to determine effect of improper container	Collected: 9/9/14 and 9/10/14 Temp: 3.5°C Br Analyzed: 9/13/14 OK SO4 Analyzed: 9/13/14 OK
ICAL for All Analytes (Minimum Three Standards and One Calibration Blank)	Initial calibration prior to sample analysis	R ≥ 0.995	Correct problem then repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.	Level II
Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 10% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Flagging criteria are not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.	Level II
Retention Time Window Position Establishment for Each Analyte and Surrogate	Once per ICAL and at the beginning of the analytical shift	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift.	NA	NA		Level II

Method Validated: 9056A | Initial Review by: T. Noreikas | Date: 10/21/14 | SDG#: 550-31313-1
Senior Review by: J. Hartness | Date: 10/21/14 | Matrix: Groundwater

COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Midrange Continuing Calibration Verification (CCV)	After every 10 field samples and at end of the analysis sequence.	All analytes within established retention time windows and within ± 10% of true value	Correct problem then repeat CCV. If that fails, then repeat ICAL. Reanalyze all samples since last successful calibration verification.	Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification, if . reanalysis is not possible.	No samples may be analyzed until the problem has been corrected.	Level II
Method Blank	One per preparatory batch	No analytes detected > ½ RL. See box D-1.	Correct problem, then see criteria in box D-1; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	Lab: Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch. Validator; Apply "B" flag if result is less than 5x method blank.		Pg 8, Br and SO4 MB 550-44628/2= ND
Laboratory Control Sample (LCS) Containing All Analytes Required to be Reported, Including Surrogates	One LCS per preparatory batch	Use laboratory in-house LCS acceptance criteria (not to exceed 20%).See Box D-3.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available (see full explanation in Appendix G)	If corrective action fails apply J-flag to specific analyte(s) in all samples in the associated preparatory batch		Pg 8, Br and SO4 LCS/LCSD 550-44628/5 & 6 OK

Method Validated: 9056A

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COMMON ANIONS ANALYSIS (METHOD 9056)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments	DQE Notes/Flags
Matrix Spike (MS)	One MS per preparatory batch per matrix (see box D- 7)	For matrix evaluation, use laboratory in-house LCS acceptance criteria (not to exceed 20%).	Examine the project-specific 000s. Contact the client as to additional measures to be taken,	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	p. 8 Br and SO4 550-31346-A-7 MS/MSD Non project sample. Not evaluated
Matrix Spike Duplicate (MSD) or Sample Duplicate	One per preparatory batch per matrix	RPD ≤15% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met. If using AFCEE; Apply "M" flag	The data shall be evaluated to determine the source of difference.	See above
Field Duplicate	Project specified – 1 dup for every 10 samples	RPD ≤10%	Qualify sample	For the specific analyte(s) in the parent & dup samples, apply J- flag if acceptance criteria are not met.		No field duplicate collected
Results Reported Between LOD and LOQ	NA	NA	NA	Apply J-flag to all results between LOD and LOQ. Validator flags: If using AFCEE; Apply "F" flag		No samples reported between LOD and LOQ
QC Blanks (Equipment Blanks and Field Blanks)	Equipment Blank – as needed Field Blank – as needed	NA	NA	Associated samples less than 5x the blank value (10x for common lab contaminants) are qualified as estimated and flagged "B".		Not collected